HITACHI
SERVICE MANUAL

YK | No.0018E

CM2086A1UX/CM2086A1EX
CM2086A3UX/CM2086A3EX

C68 Chassis

CAUTION: Before servicing this chassis, it is important that the service technician should read the "Safety Precautions" and "Product Safety Notice" in this Service Manual.

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SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

ULTRAHIGH RESOLUTION COLOR DISPLAY MONITOR

January 1988 **YOKOHAMA WORKS**

FEATURES

1. Sharp focus by IN-LINE Ultrahigh-resolution color cathode ray tube 20 inch (19V) incorporating 0.31 mm dot pitch matrix.
2. Compact chassis employing self-convergence system.
3. Bright picture with low distortion is ensured due to employment of high performance deflection yoke and transformer-less power supply.
4. Lightweight, high reliability and high-performance developed by HITACHI advanced technology on color character monitor.

SAFETY PRECAUTIONS

NOTICE: Comply with all cautions and safety related notes located on or inside the cabinet and on the chassis or picture tube.

The following precautions should be observed.

1. Do not install, remove, or handle the picture tube in any manner unless shatterproof goggles are worn.
   People not so equipped should be kept away while picture tubes are handled.
   Keep picture tube away from the body while handling.
2. When replacing a chassis in the monitor, all the protective devices must be put back in place, such as, barriers, non-metallic knobs, adjustment and compartment shields, and isolation resistor-capacitor, etc.
3. When service is required, observe the original lead dress. Extra precaution should be taken to assure correct lead dress in the high voltage circuitry area.
4. Always use the manufacturer's replacement components. Especially critical components as indicated on the circuit diagram should not be replaced by other manufacturer's. Furthermore where a short circuit has occurred, replace those components that indicate evidence of overheating.
5. Before returning a serviced monitor to the customer, the service technician must throughly test the unit to be certain that it is completely safe to operate without danger of electrical shock, and be sure that no protective device built into the monitor by the manufacturer has become defective, or inadvertently defeated during servicing.
   Therefore, the following checks should be performed for continued protection of the customer and service technician.

High Voltage

This monitor is provided with a high voltage hold down circuit for clearly indicating that voltage has increased in excess of a predetermined value.

Comply with all notes described in this Service Manual regarding this hold down circuit when servicing, so that this hold down circuit may function correctly.

Service Warning

With minimum Brightness and Contrast the operating high voltage in this display is lower than 30KV.

If any component having influence on the high voltage is replaced, confirm that the high voltage with minimum Brightness and Contrast is lower than 30KV.

To measure high voltage use a high impedance high-voltage meter. (SENSITIVE RESEARCH Model: ESH or Equivalent)

Connect (−) to chassis earth and (+) to the CDT anode button. (See the following connection diagram Fig. 1.)

NOTE:

1) Turn power switch off without fail before making the connection to the Anode button.
2) Before turn power switch ON, confirm the line voltage, set the "Voltage Selector".
3) When over 30 KV please refer to TROUBLE-SHOOTING on page 13 to 15.

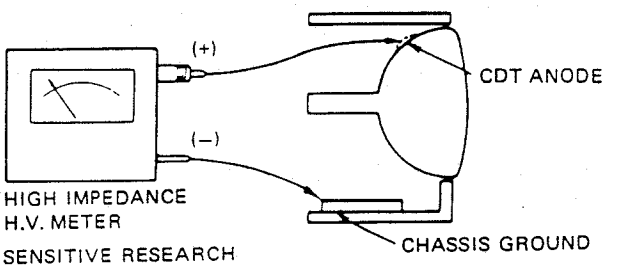

Fig. 1

X-radiation

TUBE: The primary source of X-radiation in this monitor is the picture tube. The tube utilized in this chassis is specially constructed to limit X-radiation emissions.

For continued X-radiation protection, the replacement tube must be the same type as the original, manufacturer approved type.

When troubleshooting and making test measurements in a monitor with a problem of excessive high voltage, avoid being unnecessarily close to the picture tube and the high voltage components.

Do not operate the chassis longer than is necessary to locate the cause of excessive voltage.

For Service Manuals
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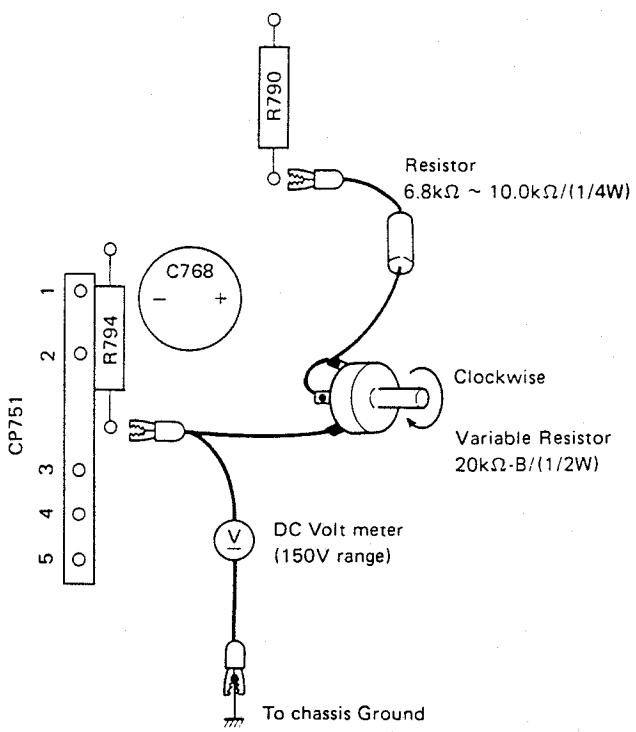
CHECK OF HIGH VOLTAGE HOLD DOWN CIRCUIT

Checking of the high Voltage hold down circuit operation.

1. Turn the switch of the unit OFF.
2. Set voltage selector switch and Brightness, Contrast controls to max.
3. Connect a DC Voltmeter and an adjustment jig as shown in Fig. 2.
4. Set the adjustment VR to fully counterclockwise.
5. Turn the switch of the unit ON and gradually rotate the adjustment VR counterclockwise.



CP751: High Voltage Hold Down Module

Fig. 2 Checking Circuit using jig

6. Check that a reading of DC voltage-meter is less-than 134 ± 3V when picture disappears.
7. Turn the switch of the unit OFF immediately after checking that the picture disappears.
8. Remove the adjusting jig and the DC voltmeter.

Note: Reading of 134V is approximately equivalent to 30 KV of CDT Anode High Voltage.

PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in the color monitor units have special safety related characteristics.

These are often not evident from visual inspection nor can the protection afforded by them necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this Service Manual.

Electrical components having such features are identified by marking with ⚠ on the schematics and on the parts list in this Service Manual.

The use of a substitute replacement component which does not have the same safety characteristics as the manufacturer recommended replacement one, shown in the parts list in this Service Manual, may create shock, fire, X-radiation, or other hazards.

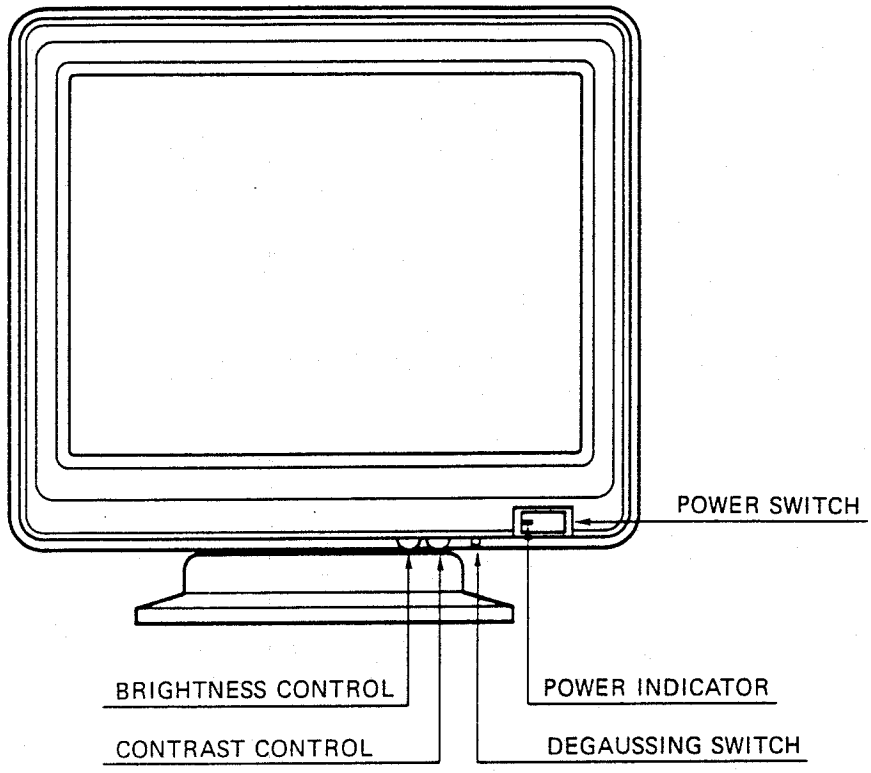
Product Safety is continuously under review and new instructions are issued from time to time. For the latest information, always consult this Service Manual.

SPECIFICATIONS

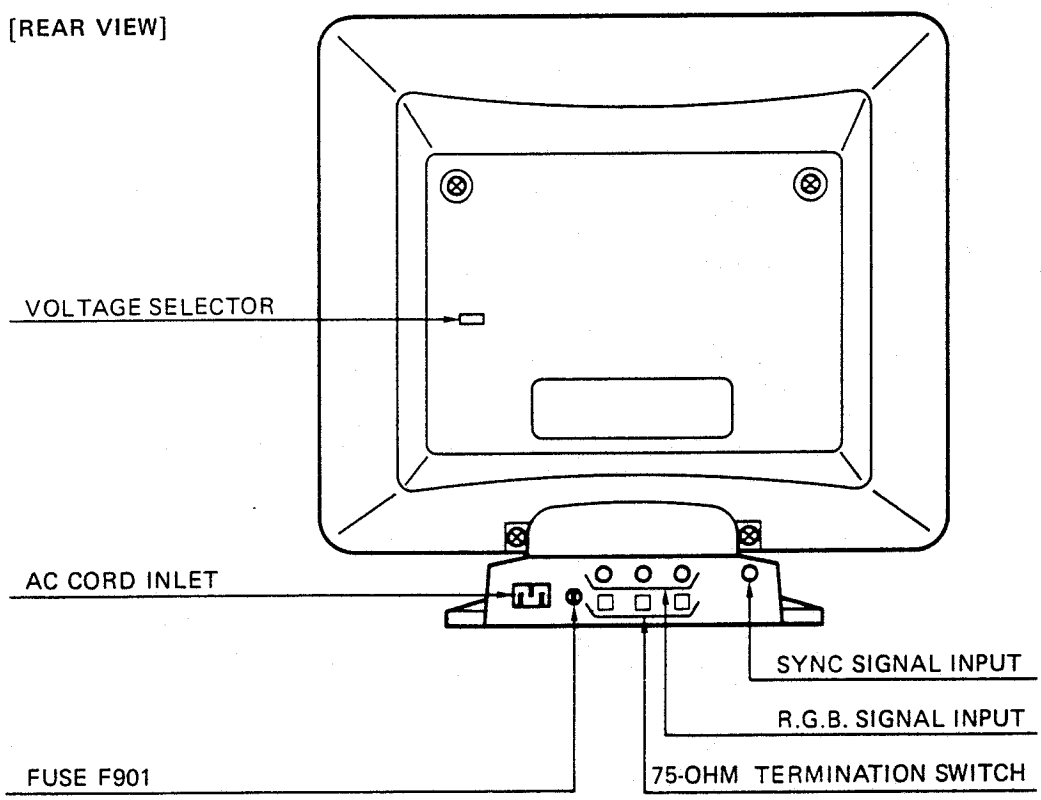
	CM2086A1UX	CM2086A3UX	CM2086A1EX	CM2086A3EX
Color Display Tube (CDT)	20 inch (19 V) 90° in-line gun tri-dot pitch 0.31 mm with non-glare panel			
Rated Voltage/freq.	AC 120/220 V 50/60 Hz	AC 120/220 V 50/60 Hz	AC 200/220/240 V 60 Hz	AC 200/220/240 V 60 Hz
Power Consumption	110 W			
R, G, B Video Signal	R/G/B Analogue input (BNC Terminal) Terminated by 75 Ω position. In case of loop through, terminated by High impedance.			
Signal Input	R/G/B Analogue Sync. on Green H/V Composite Sync.	R/G/B Analogue Sync. on Green H/V Composite Sync.	R/G/B Analogue Sync. on Green H/V Composite Sync.	R/G/B Analogue Sync. on Green H/V Composite Sync.
Frequency Pixel Rate Horizontal Vertical	 64 MHz 48.8 KHz 60 Hz	 107.3 MHz 63.9 KHz 60 Hz	 75 MHz 51.5 KHz 60 Hz	 107.3 MHz 63.9 KHz 60 Hz
Display Resolution Horizontal Vertical	 1024 Pixels 768 Lines	 1280 Pixels 1024 Lines	 1024 Pixels 800 Lines	 1280 Pixels 1024 Lines
Display Area Horizontal Vertical	 360 mm 270 mm	 340 mm 270 mm	 345 mm 270 mm	 340 mm 270 mm
Digital Dynamic Convergence	without	without	without	without
Shipping Condition Voltage Select Fuse Power Code	 AC 120 V Side 4.0A/250 (UL/CSA TYPE) UL/CSA TYPE	 AC 120 V Side 4.0A/250 (UL/CSA TYPE) UL/CSA TYPE	 AC 220 V Side 4.0AT/250V (IEC TYPE) European TYPE	 AC 220 V Side 4.0AT/250V (IEC TYPE) European TYPE
Deflection Lineality	Less than 7% of picture height			
Control	Contrast, Brightness, Degaussing			
Environment	Ambient Temperature: 0 ~ 35°C Humidity: 10 ~ 90%			
Dimensions	488(W) x 462(H) x 494(D) mm			
Weight	27 kg (Gross 31 kg)			

CONTROLS

[FRONT VIEW]



[REAR VIEW]



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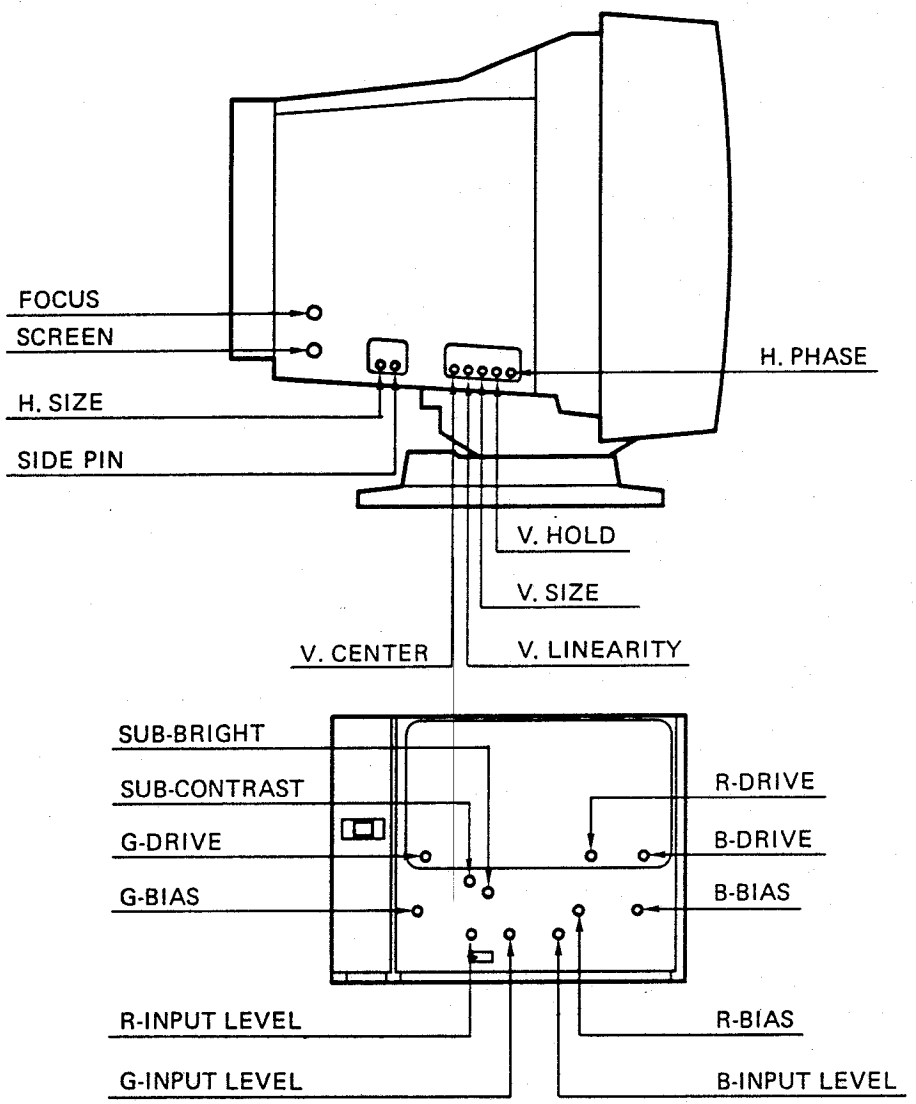
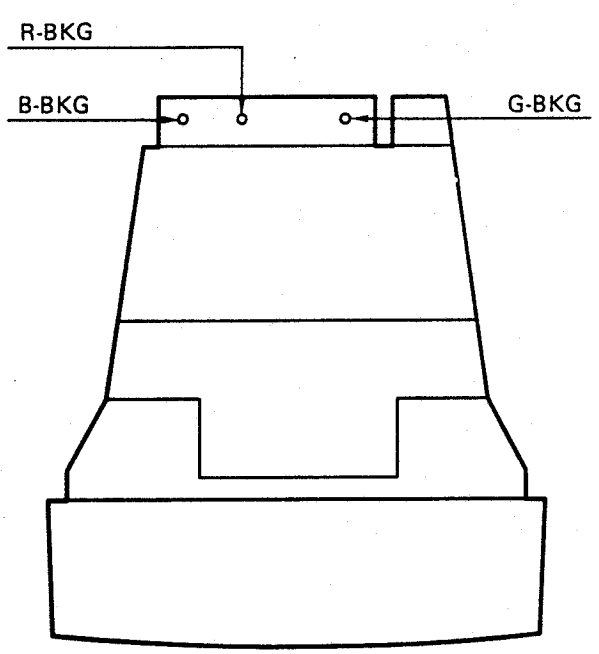

FOCUS
SCREEN
H. SIZE
SIDE PIN
H. PHASE
V. HOLD
V. SIZE
V. CENTER
V. LINEARITY
SUB-BRIGHT
SUB-CONTRAST
G-DRIVE
G-BIAS
R-DRIVE
B-DRIVE
B-BIAS
R-INPUT LEVEL
G-INPUT LEVEL
R-BIAS
B-INPUT LEVEL


R-BKG
B-BKG
G-BKG

RECOMMENDED INPUT SIGNAL

1. Horizontal Phase

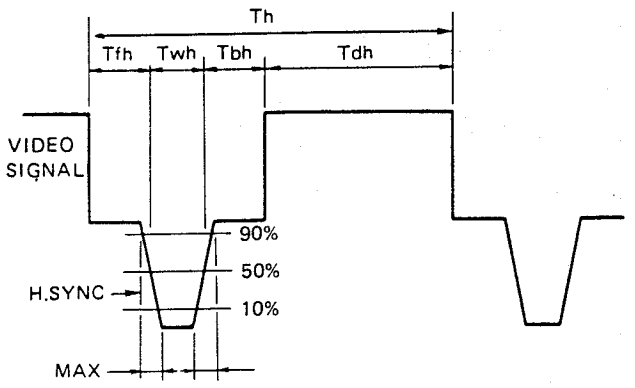


Fig. 1

2. Vertical Phase

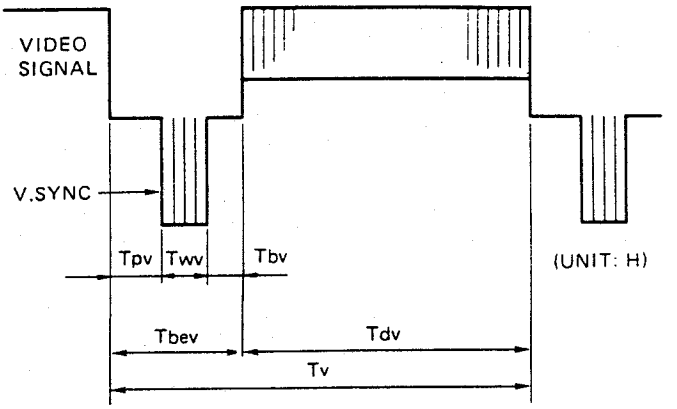


Fig. 2

	CM2086A1UX	CM2086A1EX	CM2086A3UX	CM2086A3EX
SIGNAL TIMING				
1) PIXEL FREQUENCY	64.0 MHz	75.0 MHz	107.3 MHz	107.3 MHz
2) HORIZONTAL FREQUENCY	48.8 KHz *1	51.5 KHz	63.9 KHz	63.9 KHz
Th: PERIOD	20.47 μS (1308 cl)	19.41 μS (1456 cl)	15.65 μS (1680 cl)	15.65 μS (1680 cl)
Tfh: FRONT PORCH	0.35 μS (22 cl)	0.23 μS (17 cl)	0.24 μS (26 cl)	0.24 μS (26 cl)
Twh: SYNC WIDTH	1.50 μS (96 cl)	2.97 μS (224 cl)	1.12 μS (120 cl)	1.12 μS (120 cl)
Tbh: BACK PORCH	2.60 μS (166 cl)	2.54 μS (191 cl)	2.36 μS (254 cl)	2.36 μS (254 cl)
Tbeh: BLANKING TIME	4.45 μS (284 cl)	5.74 μS (432 cl)	3.72 μS (400 cl)	3.72 μS (400 cl)
Tdh: DISPLAY TIME	16.02 μS (1024 cl)	13.65 μS (1024 cl)	11.92 μS (1280 cl)	11.92 μS (1280 cl)
3) VERTICAL FREQUENCY	60 Hz *2	60 Hz	60 Hz	60 Hz
Tv: PERIOD	16.640 mS (813 H)	16.670 mS (859 H)	16.670 mS (1065 H)	16.670 mS (1065 H)
Tfv: FRONT PORCH	0.123 mS (6 H)	0.042 mS (2 H)	0.047 mS (3 H)	0.047 mS (3 H)
Twv: SYNC WIDTH	0.123 mS (6 H)	0.077 mS (4 H)	0.047 mS (3 H)	0.047 mS (3 H)
Tbv: BACK PORCH	0.675 mS (33 H)	1.029 mS (53 H)	0.547 mS (35 H)	0.547 mS (35 H)
Tbev: BLANKING TIME	0.921 mS (45 H)	1.148 mS (59 H)	0.641 mS (41 H)	0.641 mS (41 H)
Tdv: DISPLAY TIME	15.720 mS (768 H)	15.530 mS (800 H)	16.026 mS (1024 H)	16.026 mS (1024 H)

*1: cl: clock
*2: H: Horizontal line

Table-1

Adjustment shown below is required when signals other than the recommended signal are received.

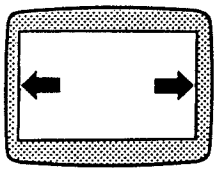
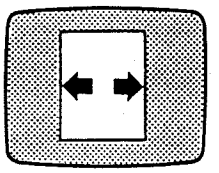
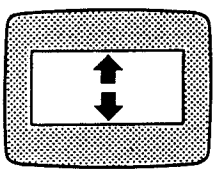
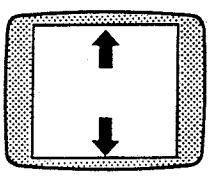
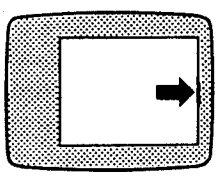
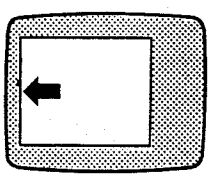
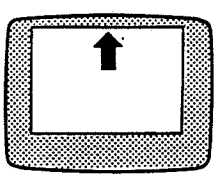
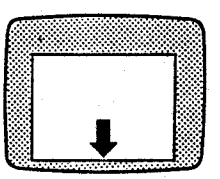
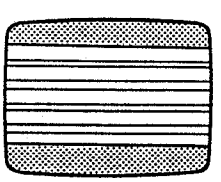
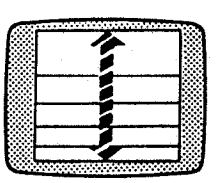
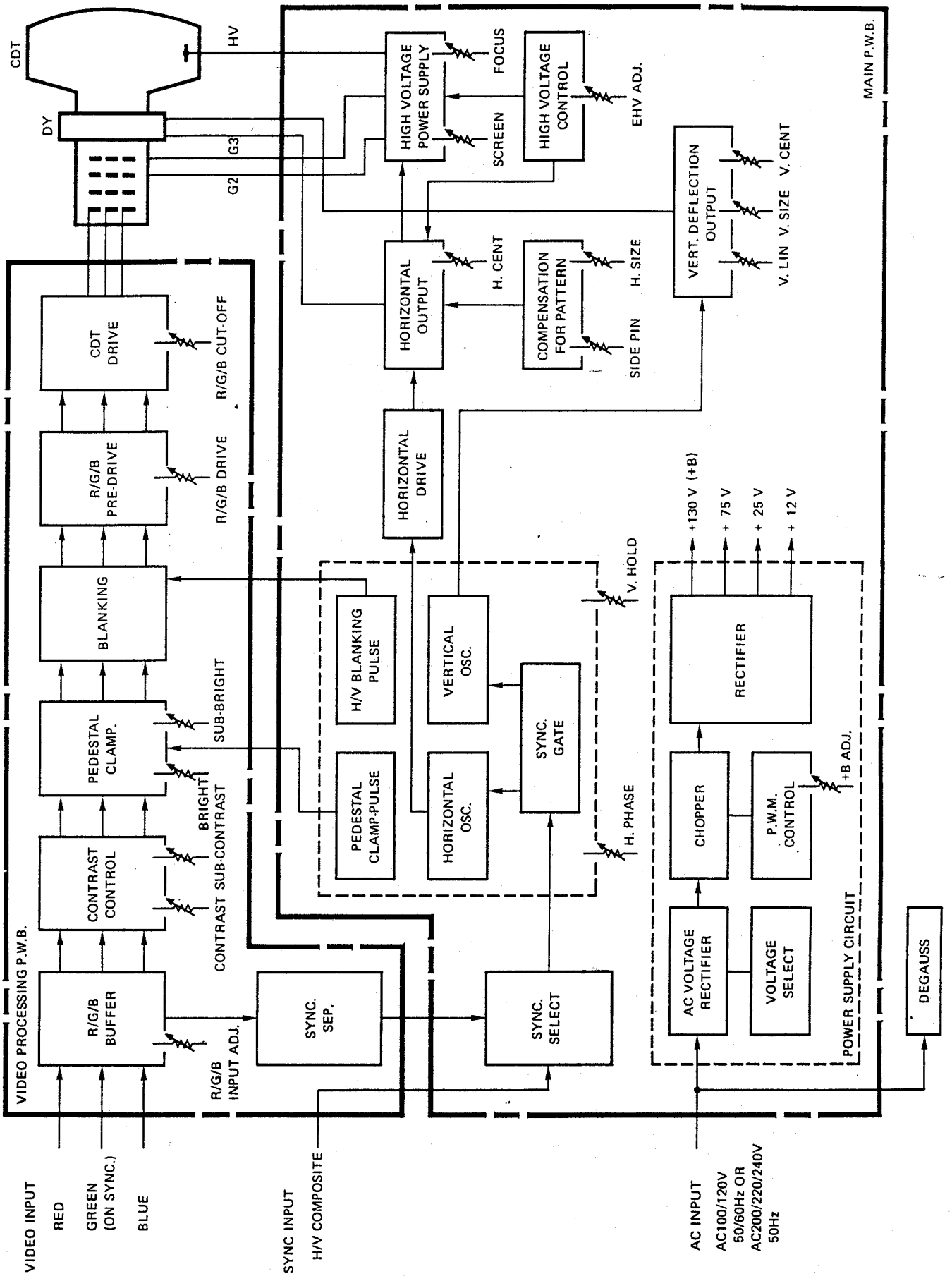
Condition	Position to be adjusted	Condition	Position to be adjusted
Picture too wide 	Adjust H Size R772	Picture too narrow 	Adjust H Size R772
Picture shortened vertically 	Adjust V Size R615	Picture stretched vertically. 	Adjust V Size R615
Picture deviated to the right 	Adjust H phase R703 (Adjust H center position R789)	Picture deviated to the left 	Adjust H phase R703 (Adjust H center position R789)
Picture deviated upward 	Adjust V center position R605	Picture deviated downward 	Adjust V center position R605
Picture has horizontal stripes 	Adjust H Hold R722	Picture rolls vertically 	Adjust V Hold R602

Table-2

BLOCK DIAGRAM



DESCRIPTION OF CIRCUIT

1. Power Supply Circuit

The power supply circuit of this unit is an isolation type, pulse width controlled switching regulator.

The schematic diagram of the power circuit is shown in page 25 and the circuit operation is described as follows:

Input AC voltage is rectified and smoothed by D901, C910 and C911. This rectified nonstabilized voltage is applied to switching transformer (T901), and chopped by transistor Q902.

The chopped voltage obtained by secondary winding of T901 is rectified by high frequency rectifier circuit and fed to load circuit.

The stabilized voltage is obtained by controlling the on-off duty ratio of chopper transistor Q902, by detecting the control winding voltage (T901 pin ③ – ④ voltage).

The pulse oscillator, error detector and pulse width controller are contained in control IC901.

The isolation between primary and secondary is comprised the switching transformer T901 and C950.

2. Deflection Circuit

The deflection circuit is comprised of the horizontal and vertical oscillator, IC (IC701), and horizontal deflection output, vertical deflection output (IC601) and extreme high voltage generator. The oscillator IC (IC701) has the following function.

2.1 Oscillator IC (IC701) function

IC701 has the following function.

(1) Horizontal AFC

The sync separator output pulse is fed to horizontal AFC and the AFC operates to control the horizontal VCO (voltage controlled oscillator) by comparing with the fly back signal (pin ⑰) from deflection output.

(2) High Voltage Limiter

The high voltage limiter circuit operates to stop the horizontal oscillation when the DC voltage detected by CP751 is applied to pin ㉗ and reaches more than the specified value. (Reaches above a certain value.) The DC voltage is applied from pin ⑦ of T752.

(3) Vertical Oscillator

The vertical oscillator oscillates the sawtooth wave which is determined by R602 and DC voltage of pin ①. The deflection yoke current is fed back via R612, R614 and is applied to pin ③ to improve vertical linearity.

(4) Vertical Drive and V. Size

The vertical oscillator output is applied to the vertical driver and the voltage feedback is applied to pin ⑤ from the vertical output. Vertical size is controlled by the drive output amplitude, and the feedback voltage is amplified by R61. The output of the vertical drive is applied to IC601, the vertical output IC.

(5) Service Switch

The service switch (S601) is a push-push switch and is installed to match the cut-off point of the CDT.

This switch pulls up the voltage of pin ① to +5.3 V to stop vertical oscillation.

(6) Clamp Gate Pulse Generator

Pedestal clamp gate pulse for video signals is outputted at pin ⑮ . The pulse is generated based on the composite signals of horizontal sync and fly-back pulse which is applied to pin ⑰ . The pulse width is determined by R712, C707.

(7) Composite Blanking Pulse Generator

H/V composite blanking pulse for video signals is also out-putted at pin ㉚ .

(8) V. Center

Changes the current flowing to Vertical DY by varying the voltage of R605.

(9) H. Size

R772 is adjustable by setting the base bias voltage of Q760 that controls the voltage between collector and emitter of Q743.

2.2 Automatic Sync Selection Circuit

The circuit is composed of IC801, IC802, Q702.

This circuit operates so that either H/V composite Sync signal or H&V composite Sync on Green signal is available and automatically select the H/V comp. site. Sync prior to the Sync on Green.

2.3 Extreme High Voltage Generator (CDT Anode Voltage)

The extreme high voltage to CDT Anode is generated by the H. Out TRS Q752, the damper diode D752, D753 and the fly-back transformer T752.

T752 output voltage is fed back to the high voltage stabilizing circuits (Q754–Q759) via R766 from R793.

Q758 controls the output voltage so that the CDT Anode voltage is constant.

2.4 Slide Pin Cushion Distortion Correction

Vertical output sawtooth voltage is filtered by R619, R621, and fed to Q761.

The parabolic waveform at the base electrode of Q761 is changed by R620 in amplitude and/or by R621 in phase. The parabolic voltage for side pin correction is superimposed to the DC voltage which determines H-size in Q760, Q761 and fed to S-curve correction condenser C774, C775 via Q762, IC751, IC752 and Q764.

The applied voltage of the horizontal deflection yoke is fluctuated by the parabolic voltage of C774, C775 so that the vertical line on screen is straight.

2.5 High Voltage Hold Down Circuit

The function of CP751 is detecter of abnormal extreme high voltage.

When the voltage of Pin (1) in CP751 which is proportional to EHV exceeds the specified threshold voltage, the voltage of pin (3) in CP751 becomes high level and is fed to pin (27) of IC701 resulted in stopping the horizontal oscillation.

2.6 H-Center

H-Center circuit is composed of R789, D759, D760, L754, C767.

The DC current component of the horizontal deflection yoke is varried by adjusting of R789.

So that the raster location on screen is centered.

2.7 H Size Stabilizing Circuit

When the beam current of CDT is constant, the H-size on screen is determined by setting R772, and is constant. The beam current and EHV however, are changed by APL of picture.

The H-size stabilizing circuit operates so as that the H-size on screen is constant even though EHV change.

When EHV change, the emitter voltage of Q758 is changed and fed to Q762 via R775, R776. The alteration of emitter voltage of Q758 reach to C774, C775 via IC751, IC752 Q764. The function of IC751 is stabilization of DC control by means of DC negative feed-back loop R786, R787 C779, R798. The function of IC752 is PWM (pulse width modulation) of the alteration voltage described above synchronized by fH, in order to superimpose to C774, C775.

2.8 Spot Killer Circuit

This circuit is composed of C769, R791, R765, D101 C102.

The G1 voltage during power on is nearly Zero V. Just after power off, the G1 voltage become negative so that the beam current of CDT is shut off and the beam spot on the screen does not appear.

3. Video Amplifier Circuit

The video amplifier circuit of this monitor unit is a high performance video amplifier circuit to achieve a wide frequency band. The operation of the red/green/blue video amplifier circuits are the same, so operation of only the red video amplifier circuit is described as follows:

When an analog signal is inputted, the signal is applied to contrast control circuit (Q233, Q235, Q236). The contrast control circuit controls the photo-coupled resistor (CD231) and also controls the signal amplitude. The output signal from contrast control circuit is fed to the pedestal clamp circuit (Q331) that controls the pedestal level of the input signal to be at a constant level.

The DC stabilized signal is amplified by Q333, Q334 and fed to CDT drive output Q336, Q337. The output amplifier is a cascade-connected amplifier which improves the frequency response and drives the CDT cathode.

The cathode clamp system by means of Q338 operates as peak clamper at sync tip and is used for the cut-off adjustment of the CDT.

Brightness is achieved by controlling the pedestal clamp voltage by R416, R452. The blanking circuit is comprised with Q405, D301, D331.

ADJUSTMENTS

1. Horizontal/Vertical sync. adjustment

(1) Monitor a pattern.
(2) Remove the sync input signal.
(3) Adjust R722 (H. HOLD) so that the picture nearly stops rolling horizontally.
(4) Turn R602 (V. HOLD) to adjust to become the center of the vertical sync holding range.

2. Other adjustment

Receive a cross-hatch test signal

(1) Adjust vertical linearity to its best using the V. LIN VR (R614).
(2) Adjust the vertical amplitude to 270 mm using the V. SIZE VR (R615).
(3) Adjust the vertical position of the picture to the center of the CDT using the V. CENT VR (R605).
(4) Apply marking in the center position of screen VR (T752), next turn the screen VR counterclockwise to appear back raster. Adjust the H. CENT VR (R789) so that the center of back raster is positioned 1 mm to the center of the CDT. Then, return the screen VR to its original position.
(5) Adjust the H. PHASE VR (R703) so that the horizontal picture position is roughly at the center of the CDT.
(6) Adjust the SIDE PIN VR (R620) so that the pincushion distortion on the left and right side of the picture is minimum.

3. Focus adjustment

(1) Receive the white "E" signal of characters.
(2) Adjust the focus VR so that the characters all over the screen are clear (with a signal green color).
(3) Check the focus characteristics of signal red color and signal blue color in the same way as in item (2). When the characteristics for either of the colors are incorrect, re-adjust focus.

4. White balance adjustment (Back ground)

Special adjusting tool is provided for turning VRs on the current board inside of the shielded case.

(1) Ensure monitor has warmed up for at least 15 minutes.
(2) Set user contrast control at maximum and user brightness control at mechanical center.
(3) Receive no monitor signal but sync. signal . . . Black monitor.
(4) Turn the SCREEN VR 10°C to clockwise.
(5) Turn three BKG VRs fully counterclockwise.
(6) Set the SUB BRIGHTNESS VR at the mechanical center.
(7) Set the S601 to service side.
(8) Turn three BKG VRs clockwise to set them just before three colors appear as horizontal single line.
(9) Set the SCREEN VE at the first position (V screen ≃ 550 ±10V).
(10) Set the S601 to normal side.
(11) Put all white signal.
(12) Set the user contrast control at minimum.

5. White balance adjustment

(1) Receive all white signal.
(2) Turn the user brightness control fully clockwise.
(3) Turn the user contrast control so that the brightness is 28 ± 1 ft-L.
(4) Adjust high light white balance by DRIVE VRs.
(5) Turn the user contrast control to counter clockwise so that the screen is dark (≃ 3 ft-L).
(6) Adjust BKG VRs to obtain low light white and high light white.

6. Sub-brightness adjustment

(1) Set user contrast control at maximum and user brightness control at maximum.
(2) Receive a stairstep signal.
(3) Adjust SUB-BRIGHTNESS VR R416 so that the first black step just disappear.

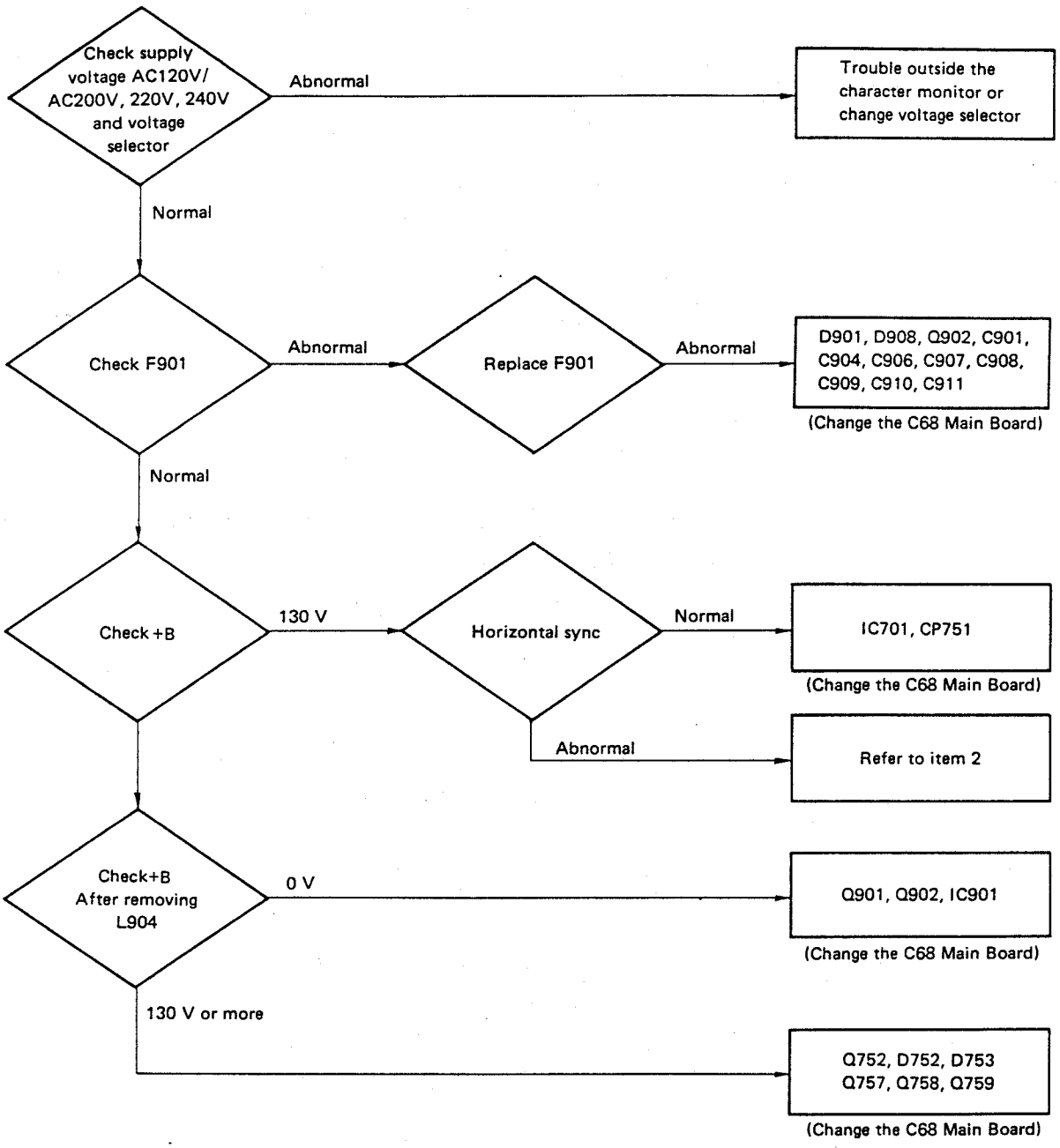
7. Sub-contrast adjustment

(1) Set user contrast control at maximum and user brightness control maximum.
(2) Adjust SUB-CONTRAST VR R408 not to saturate the white characters.

TROUBLESHOOTING

1. RASTER DOES NOT APPEAR

Relevant circuits: Power circuit, Horizontal deflection circuit, High voltage limiter circuit



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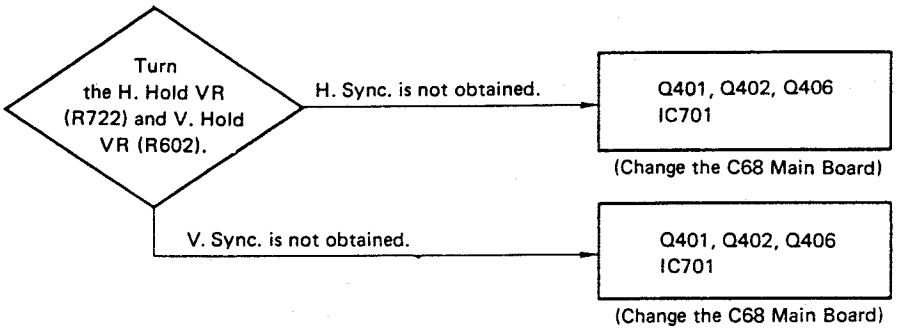
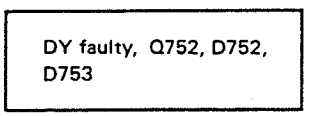
2. SYNCHRONIZATION IS NOT OBTAINED

Relevant circuit: Sync. input circuit, IC701


Turn the H. Hold VR (R722) and V. Hold VR (R602).
H. Sync. is not obtained.
Q401, Q402, Q406
IC701
(Change the C68 Main Board)
V. Sync. is not obtained.
Q401, Q402, Q406
IC701
(Change the C68 Main Board)

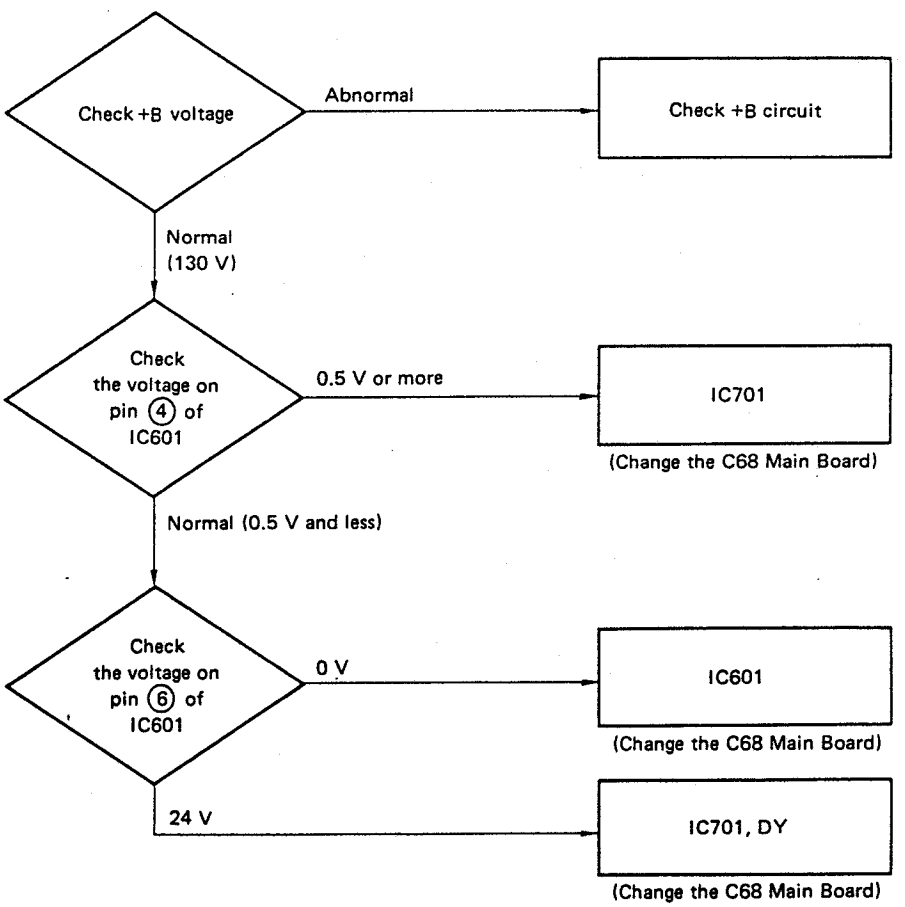
3. SINGLE VERTICAL LINE

Relevant circuit: Horizontal output circuit



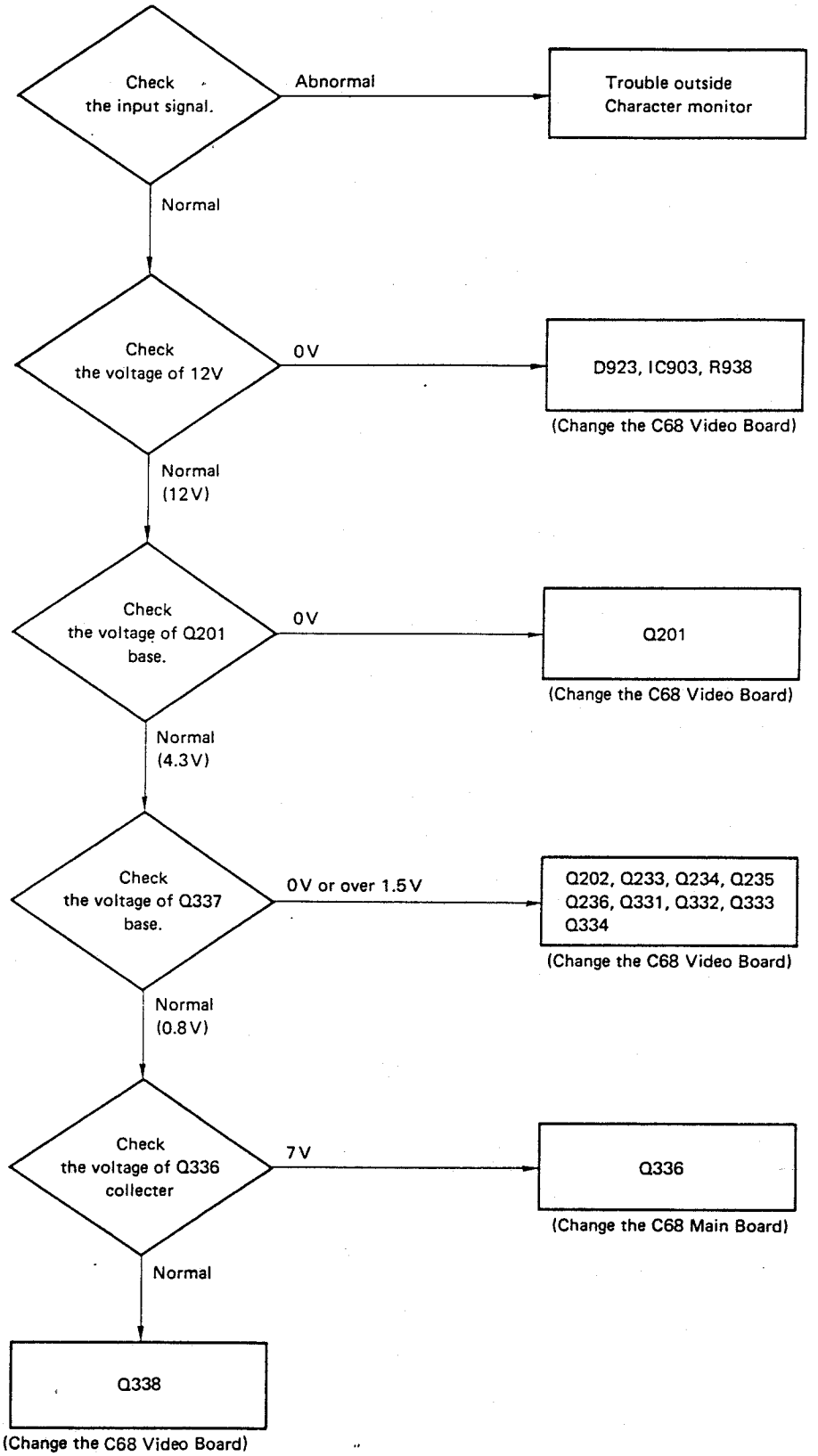
4. HORIZONTAL SINGLE LINE

Relevant circuit: Vertical deflection circuit



5. COLOR DOES NOT APPEAR

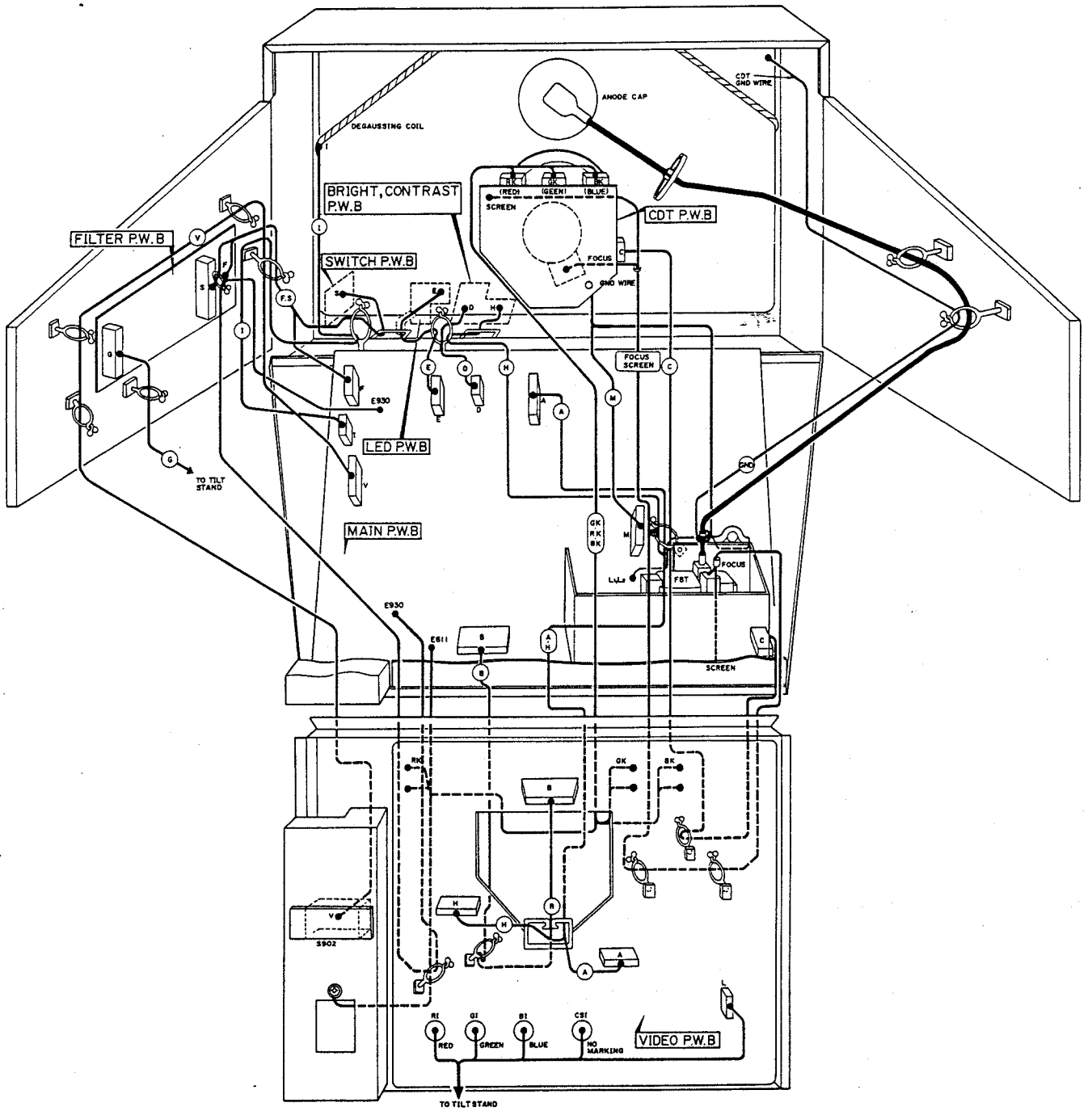
Relevant circuit: Video amplifier circuit



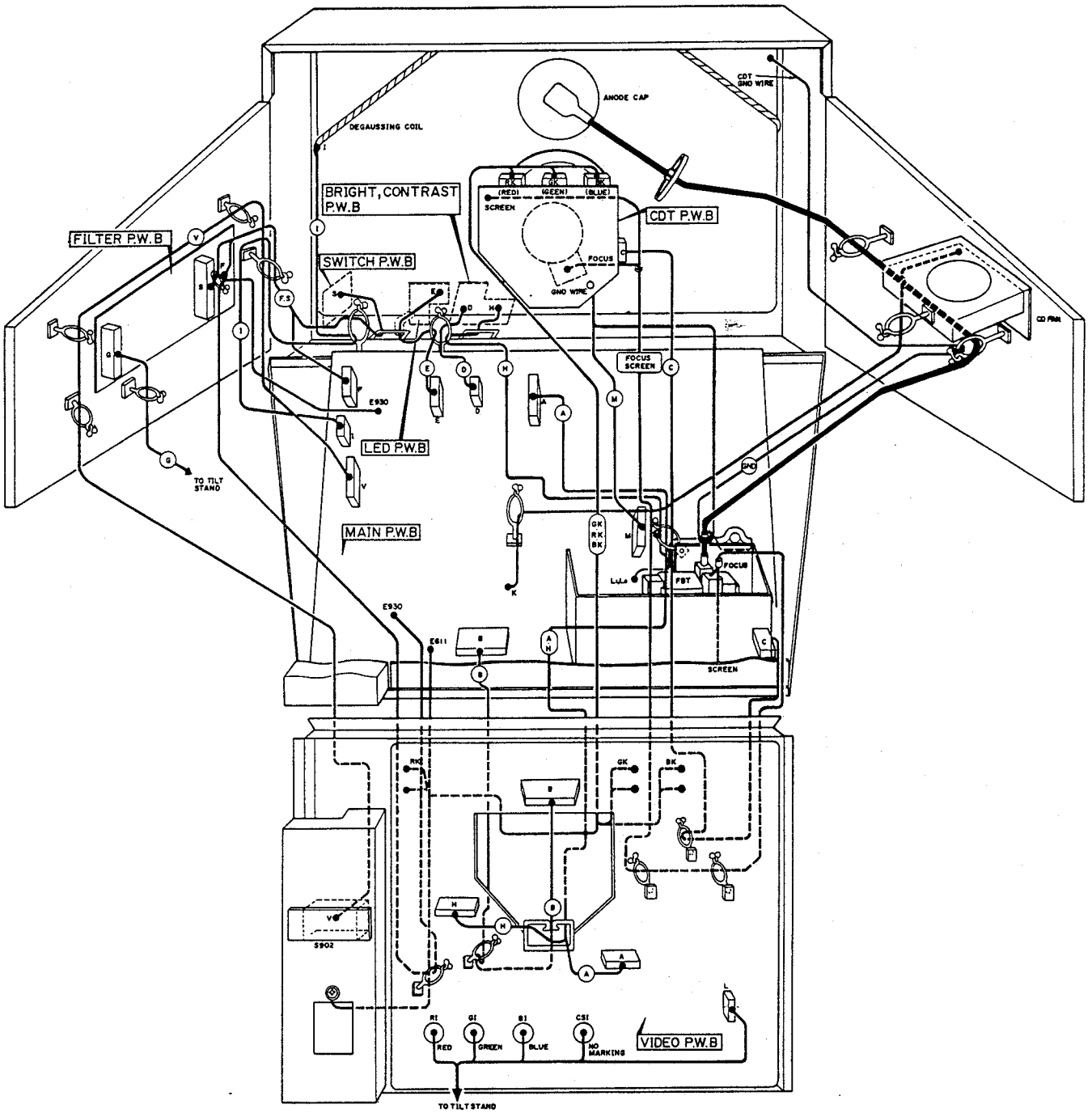
Note: Trouble in the red circuit is shown in this diagram as representative color.
Refer to: when green does not appear, and when blue does not appear.

WIRING DIAGRAM

CM2086A1EX, CM2086A1UX

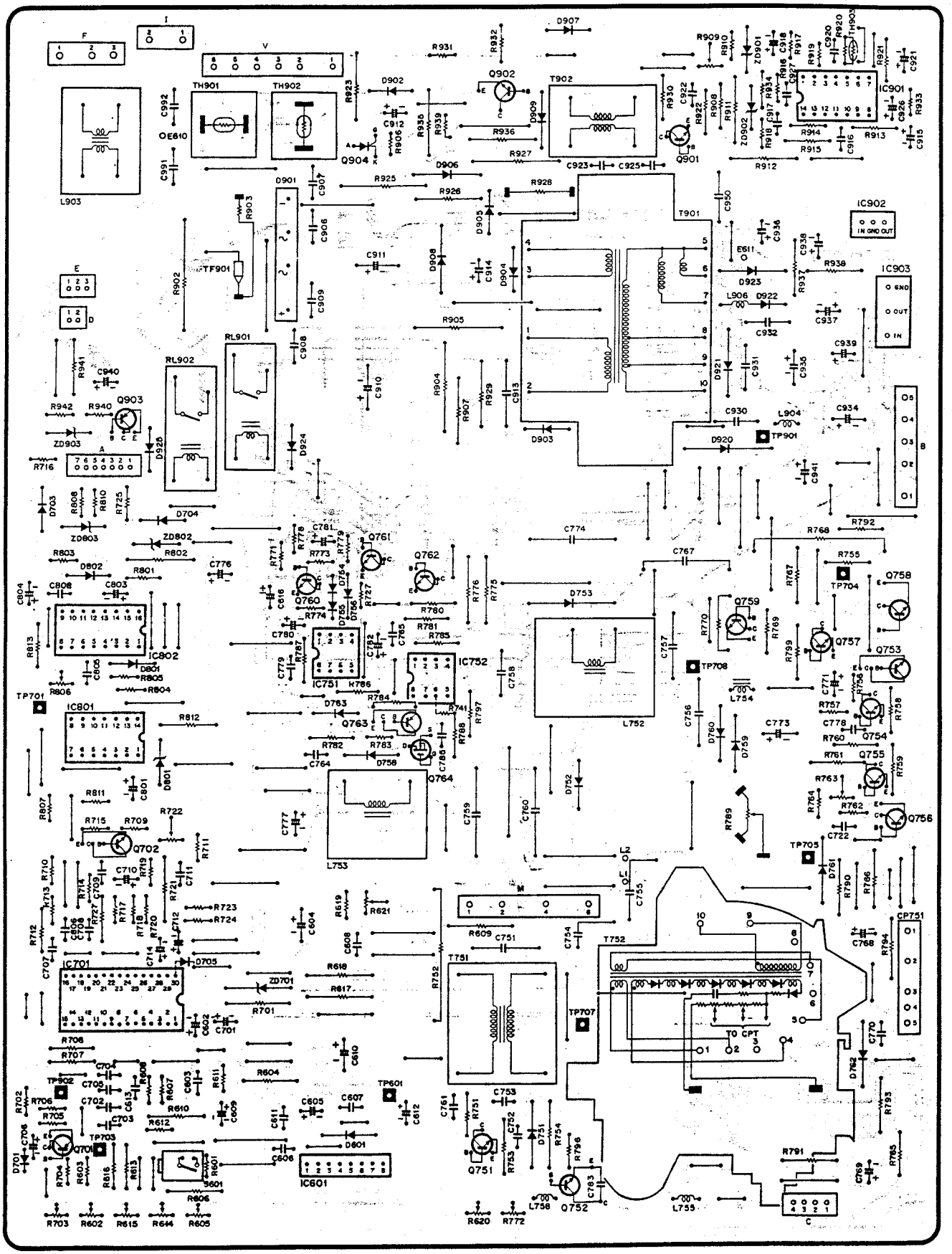


CM2086A3EX, CM2086A3UX

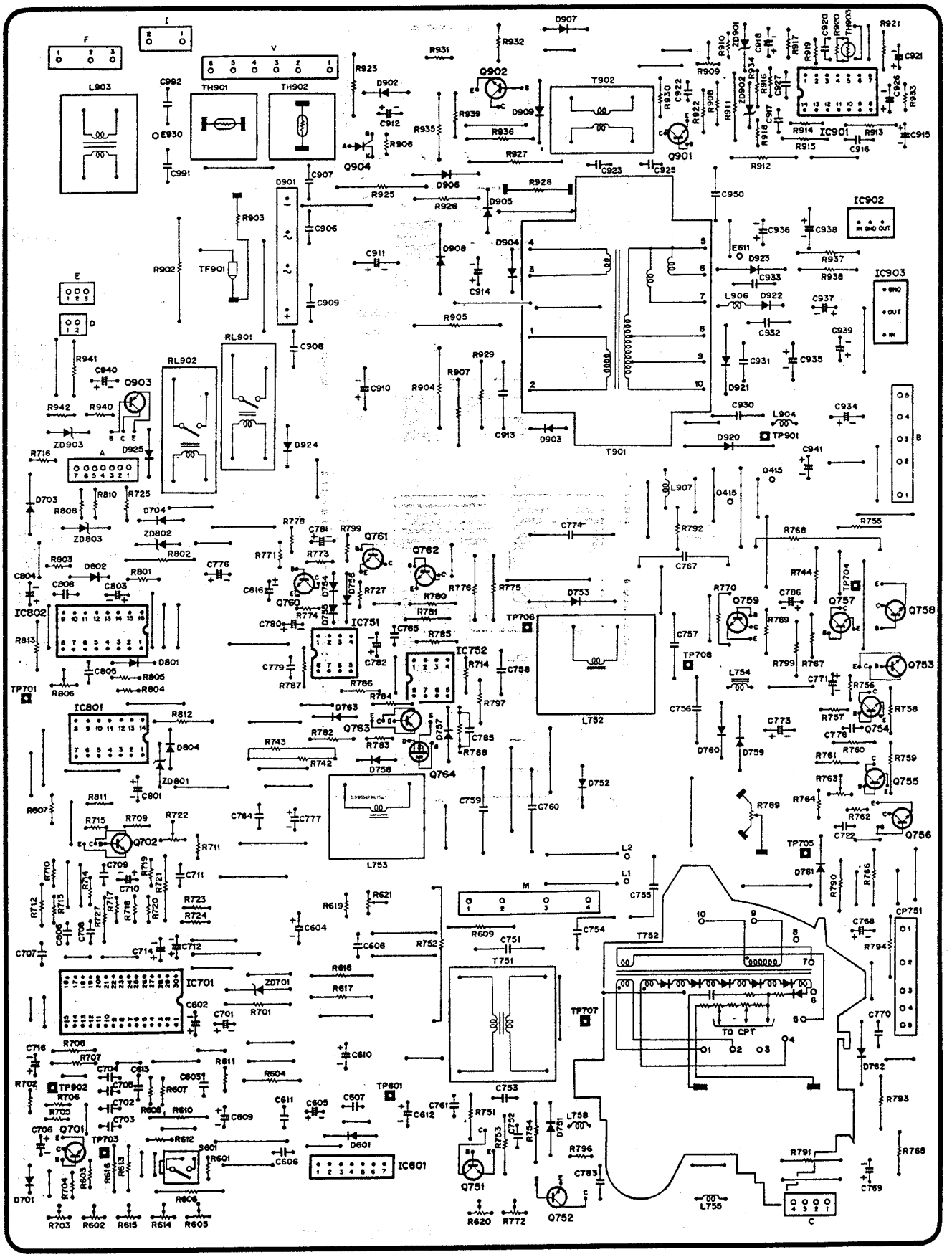


PRINTED WIRING BOARD

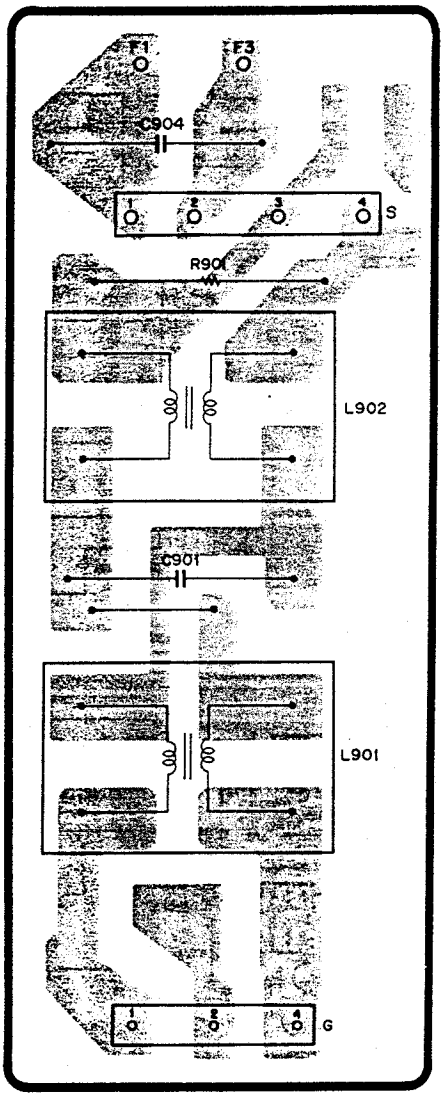
MAIN P.W.B. (CM2086A1EX: Serial No. 1 ~ 525) (CM2086A1UX: Serial No. 1 ~ 50) (CM2086A3EX: Serial No. 1 ~ 100) (CM2086A3UX: Serial No. 1 ~ 20)



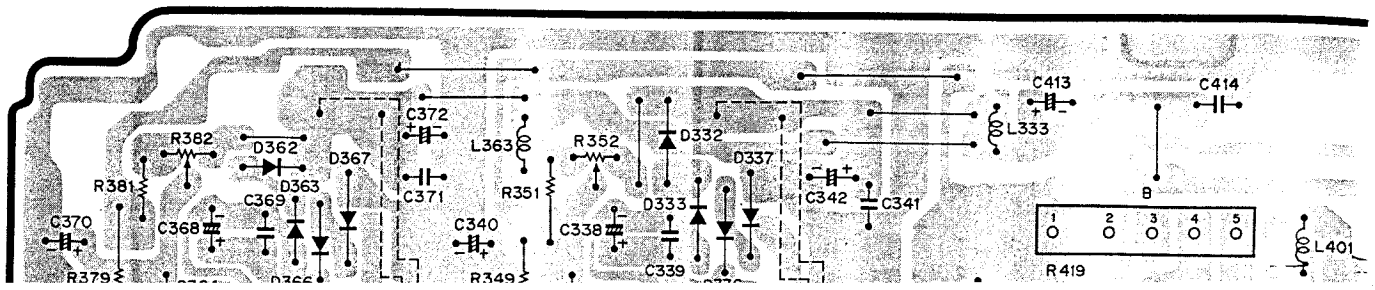
MAIN P.W.B. (CM2086A1EX: Serial No. 526 ~) (CM2086A1UX: Serial No. 51 ~)
(CM2086A3EX: Serial No. 101 ~) (CM2086A3UX: Serial No. 21 ~)



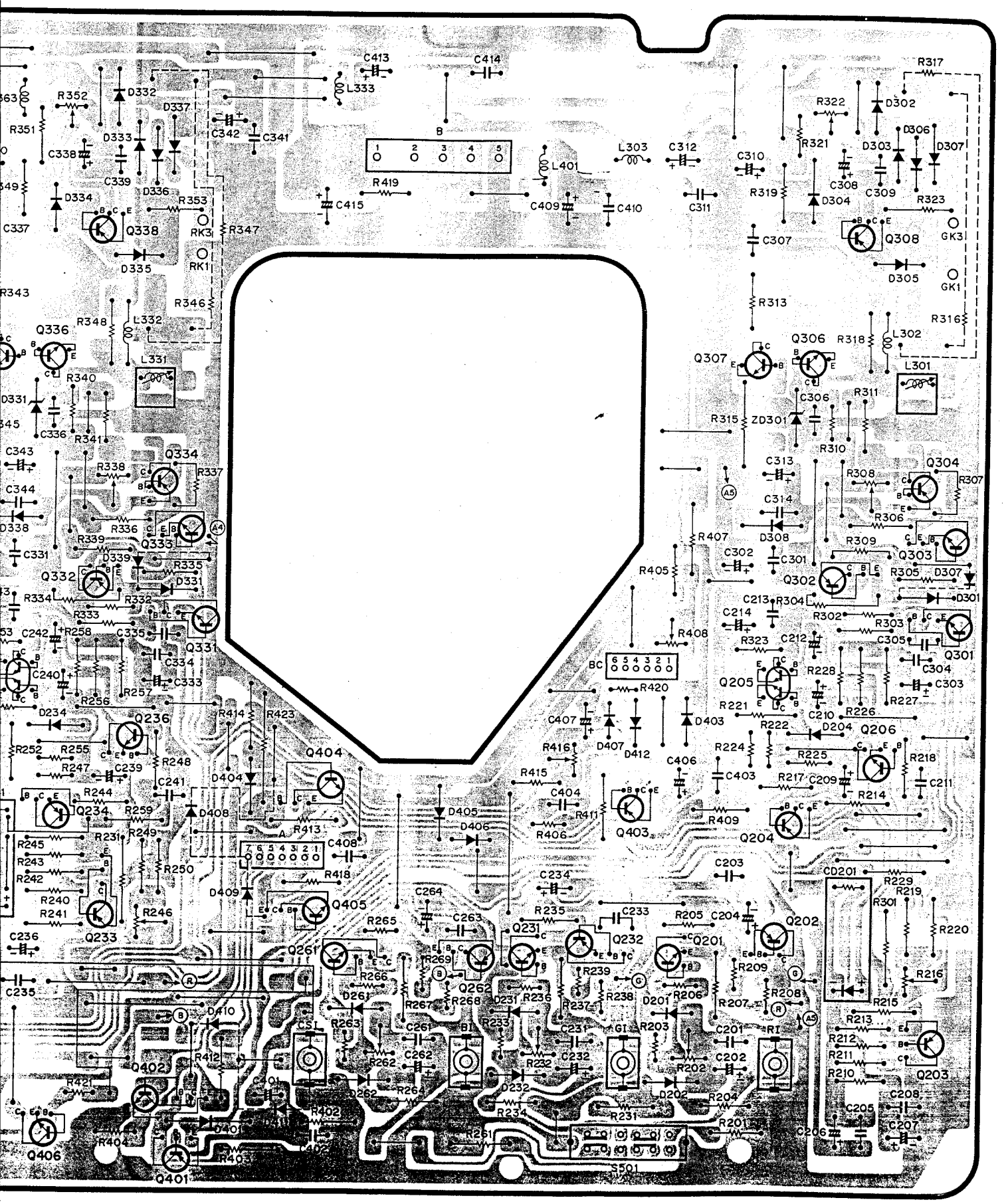
FILTER P.W.B.



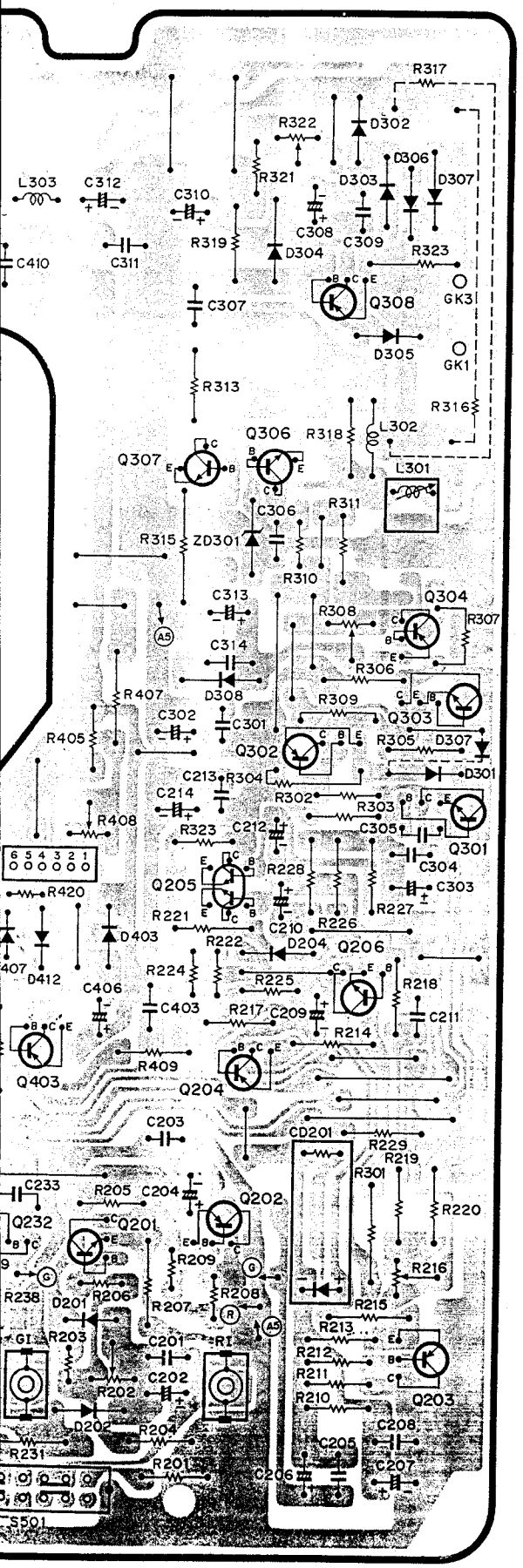
VIDEO P.W.B. (CM2086A1EX: Serial No. 1 ~ 525) (CM2086A1UX: Serial No. 1 ~ 50) (CM2086A3EX: Serial No. 1 ~ 100)



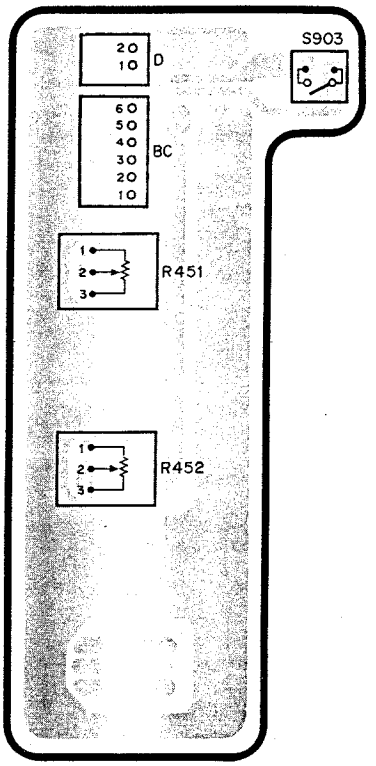
.1 ~ 525) (CM2086A1UX: Serial No. 1 ~ 50) (CM2086A3EX: Serial No. 1 ~ 100) (CM2086A3UX: Serial No. 1 ~ 20)



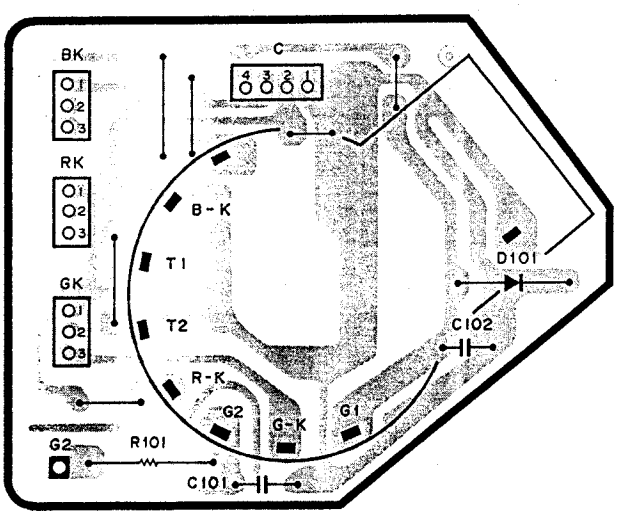
M2086A3UX: Serial No. 1 ~ 20)



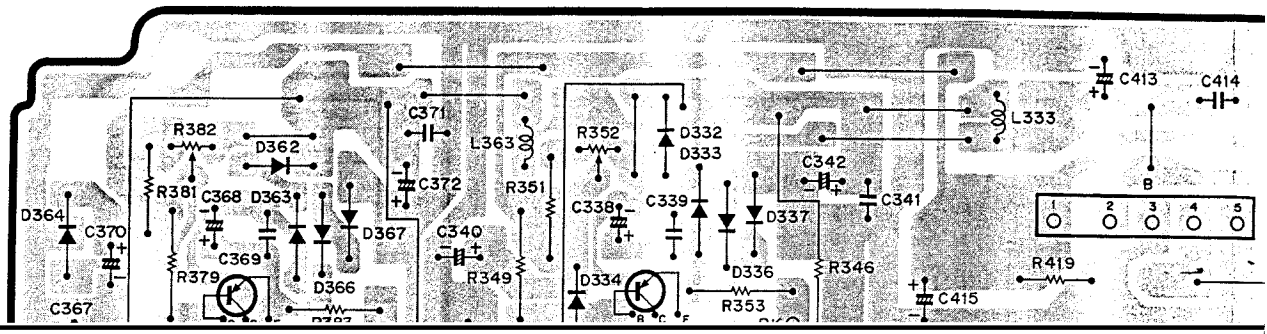
BRIGHT, CONTRAST P.W.B.



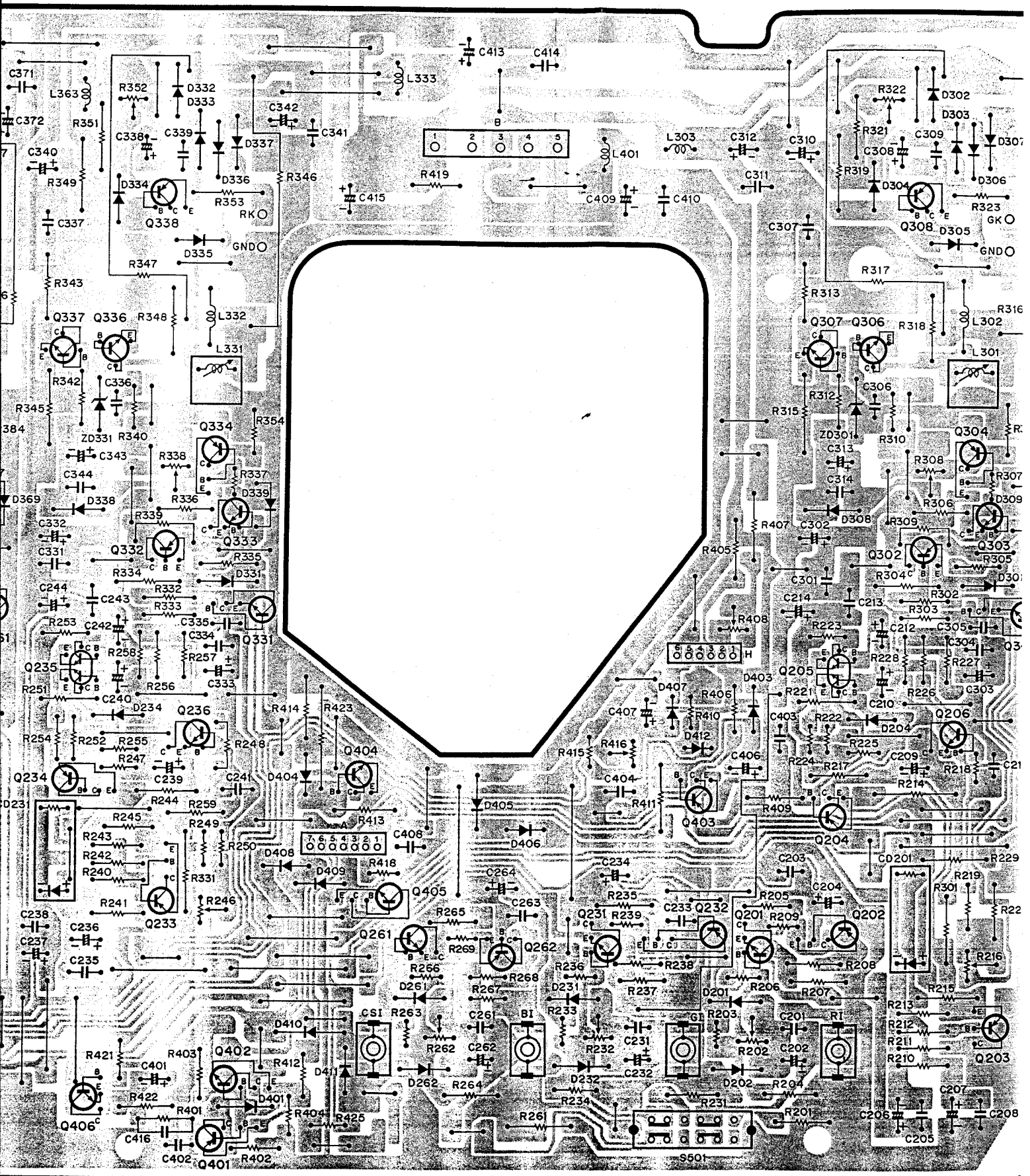
CDT P.W.B.



VIDEO P.W.B. (CM2086A1EX: Serial No. 526 ~) (CM2086A1UX: Serial No. 51 ~) (CM2086A3EX: Serial No. 101



erial No. 526 ~) (CM2086A1UX: Serial No. 51 ~) (CM2086A3EX: Serial No. 101 ~) (CM2086A3UX: Serial No. 21 ~)



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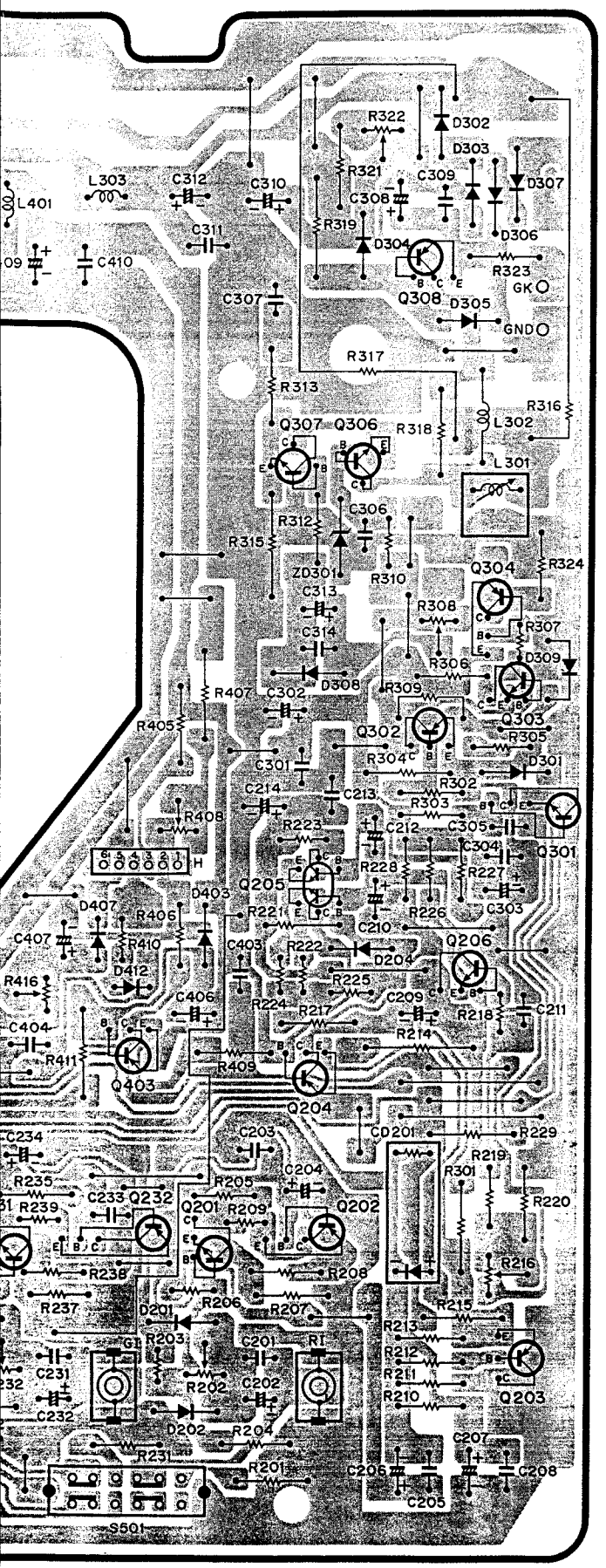
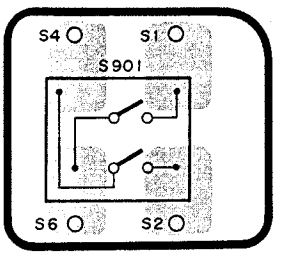
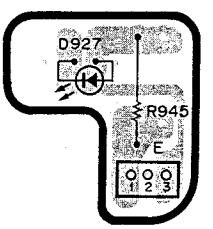
(CM2086A3UX: Serial No. 21 ~)



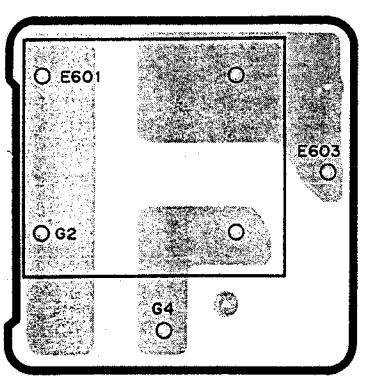
SWITCH P.W.B.

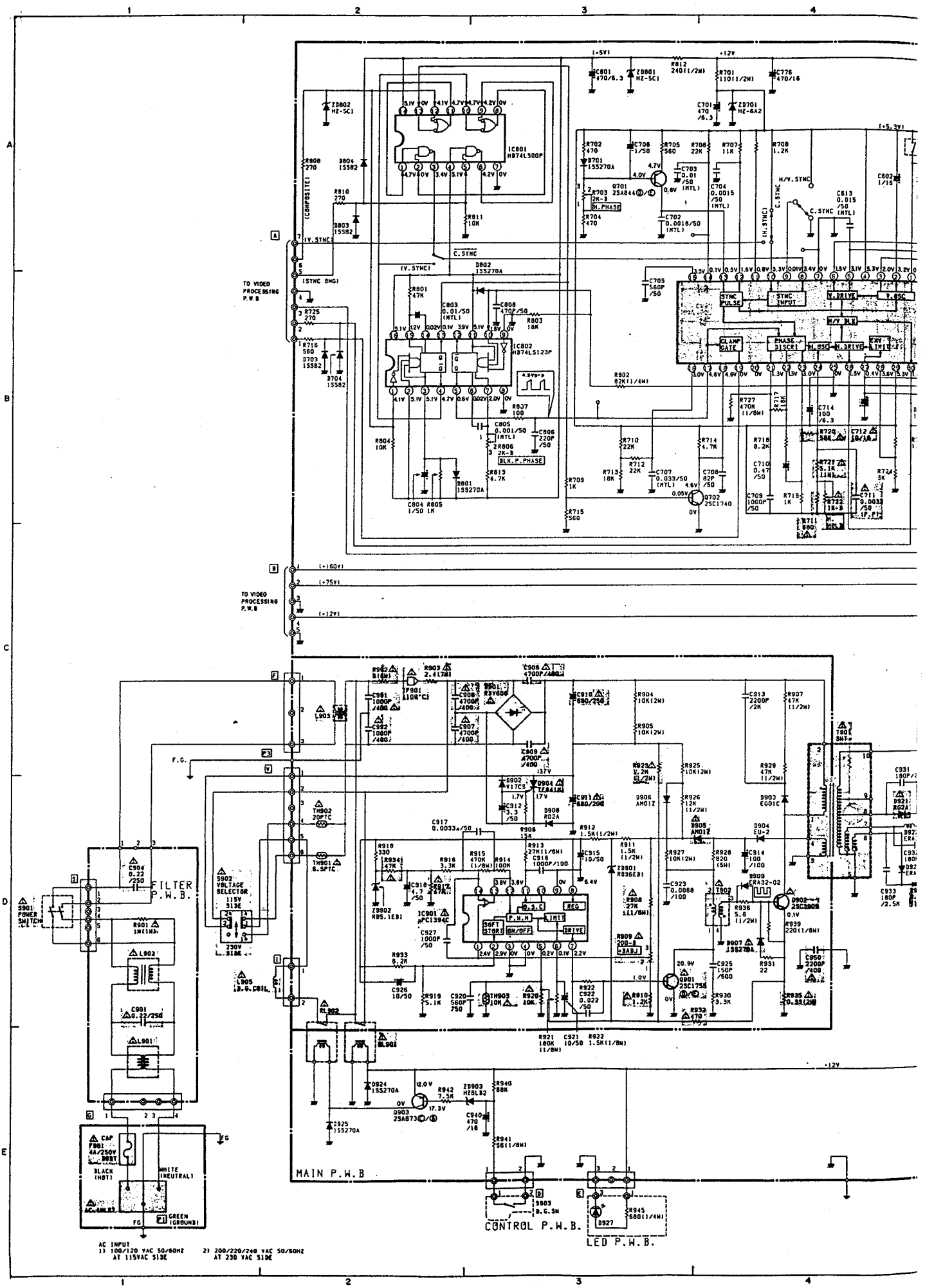


LED P.W.B.



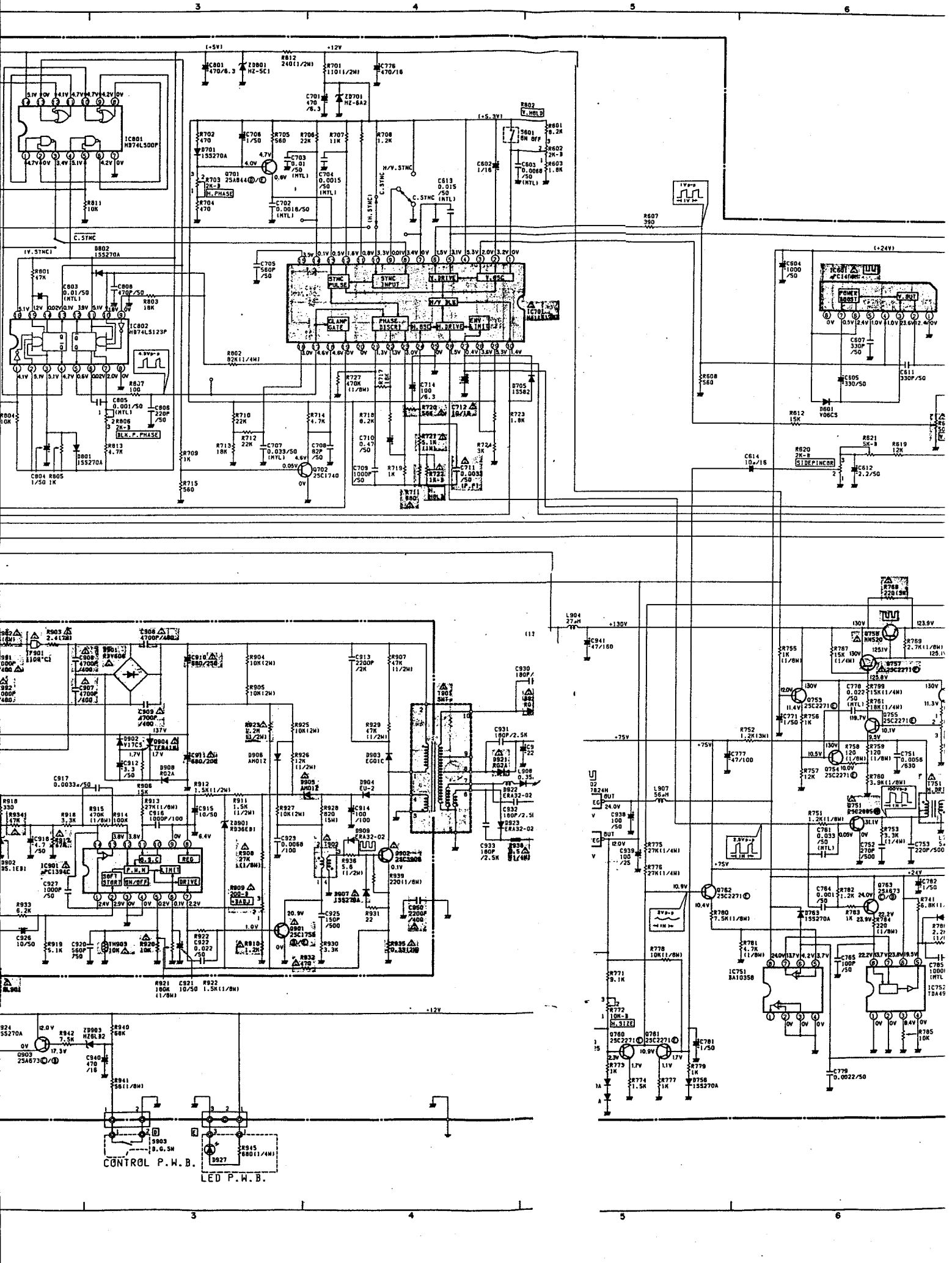
AC INLET P.W.B.



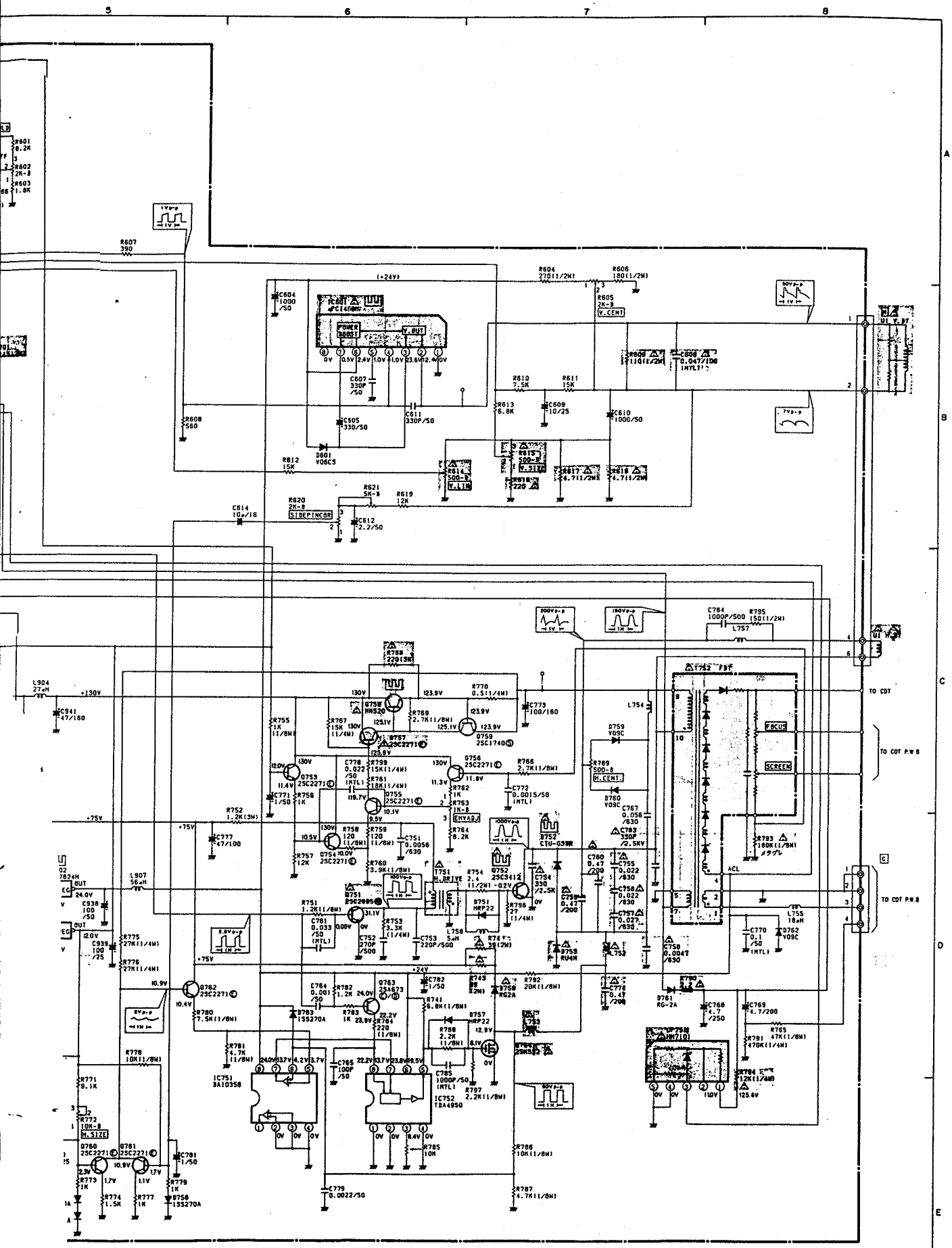

MAIN P.W.B
CONTROL P.W.B.
LED P.W.B.
FILTER P.W.B.
TO VIDEO PROCESSING P.W.B
TO VIDEO PROCESSING P.W.B
AC INPUT
1) 100/120 VAC 50/60HZ AT 115VAC SIDE
2) 200/220/240 VAC 50/60HZ AT 230 VAC SIDE
BLACK (HOT)
WHITE (NEUTRAL)
GREEN (GROUND)
IC801 HD74LS00P
IC802 HD74LS123P
IC901 μPC1394C
Q701 2SA844
Q702 2SC1740
Q901 2SC1755
Q902 2SC1906
Q903 2SA873
D927
SYNC PULSE
SYNC INPUT
V.DRIVE
V.OSC
H/V P.U
CLAMP GATE
PHASE DISCRI
H.OSC
H.DRIVE
H.LIMIT
SOFT START
ON/OFF
DRIVE
REG
P.W.M
LIMIT
D.G.C
H.PHASE
BLK.P.PHASE
V.SYNC
C.SYNC
H/V.SYNC
(+5V)
(+12V)
(+160V)
(+75V)

BASIC CIRCUIT DIAGRAM OF MAIN BOARD
(CM2086A1EX)

PRODUCT SAFETY NOTE: Compon
safety. Before replacing any of these
Manual. Don't degrade the safety of the

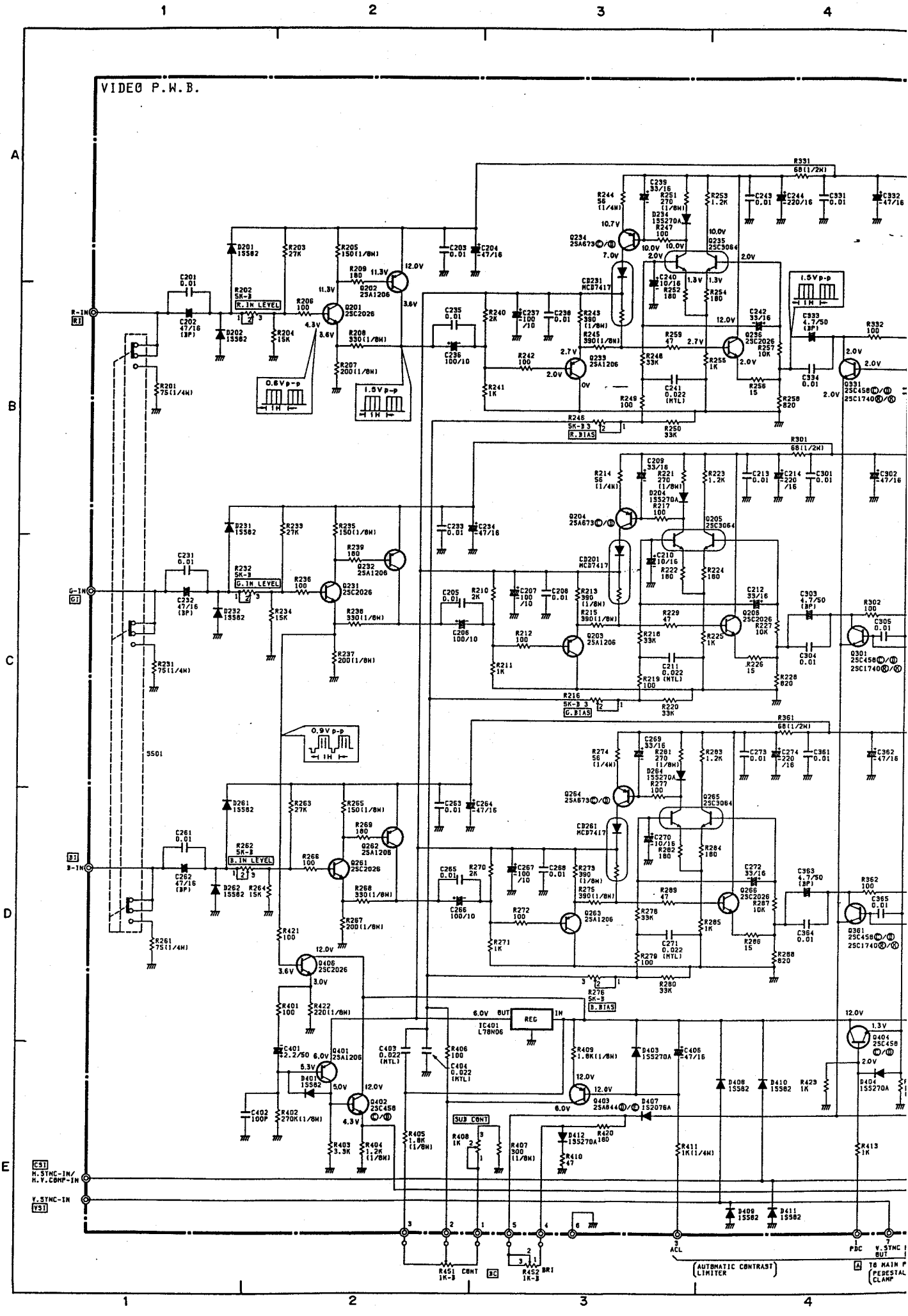


PRODUCT SAFETY NOTE: Components marked with a ⚠ and shaded have special characteristics important to safety. Before replacing any of these components, read carefully the PRODUCT SAFETY NOTICE of this Service Manual. Don't degrade the safety of the receiver though improper servicing.



- This is a basic circuit diagram for CM2086A1EX, See the repalacement parts list (P. 27 ~ 31) for another model.
- Since this is a basic circuit diagram, the value of the parts is subject to be altered for improvement.

* Since this is a basic circuit diagram, the value of the parts is subject to be altered for improvement.



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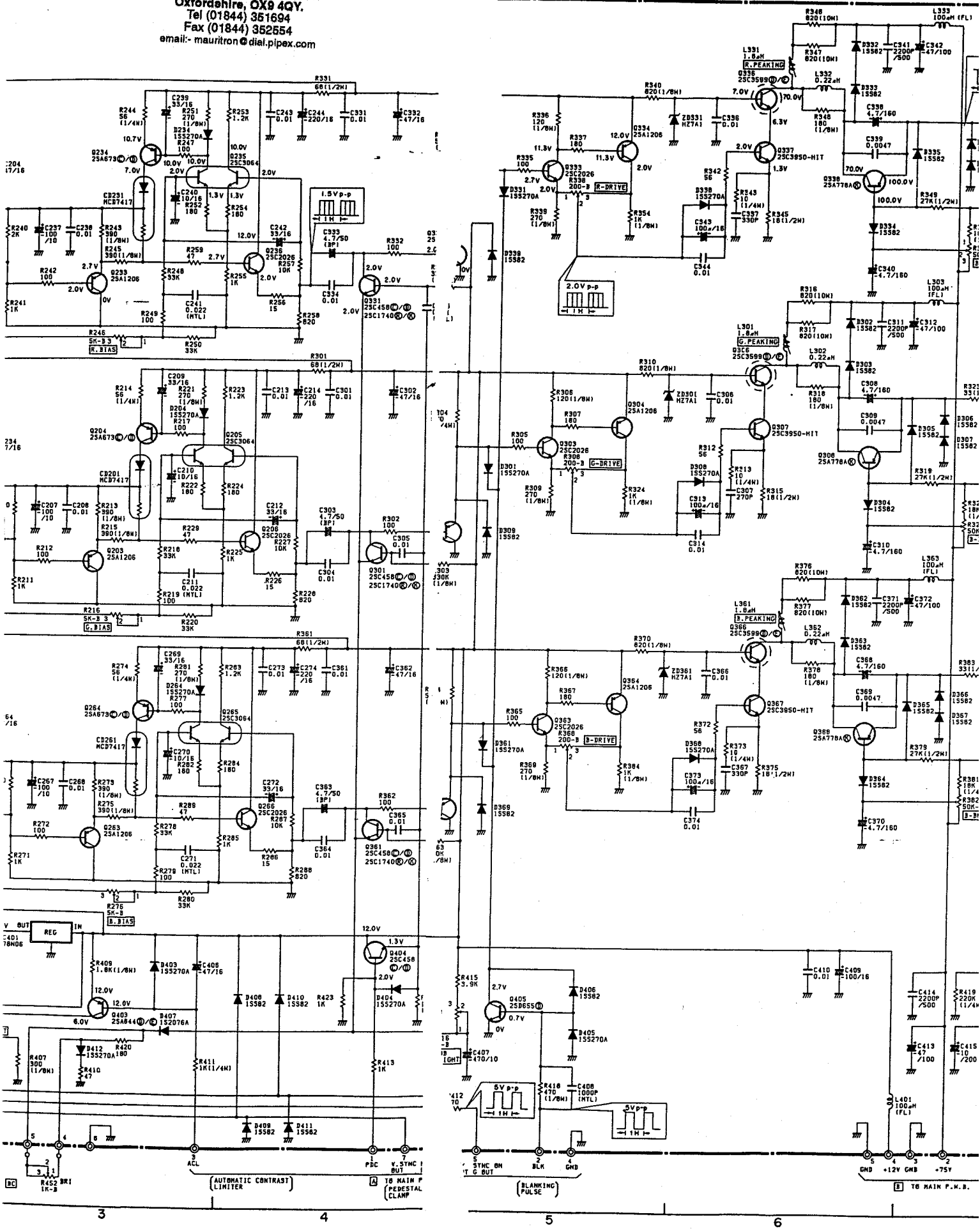

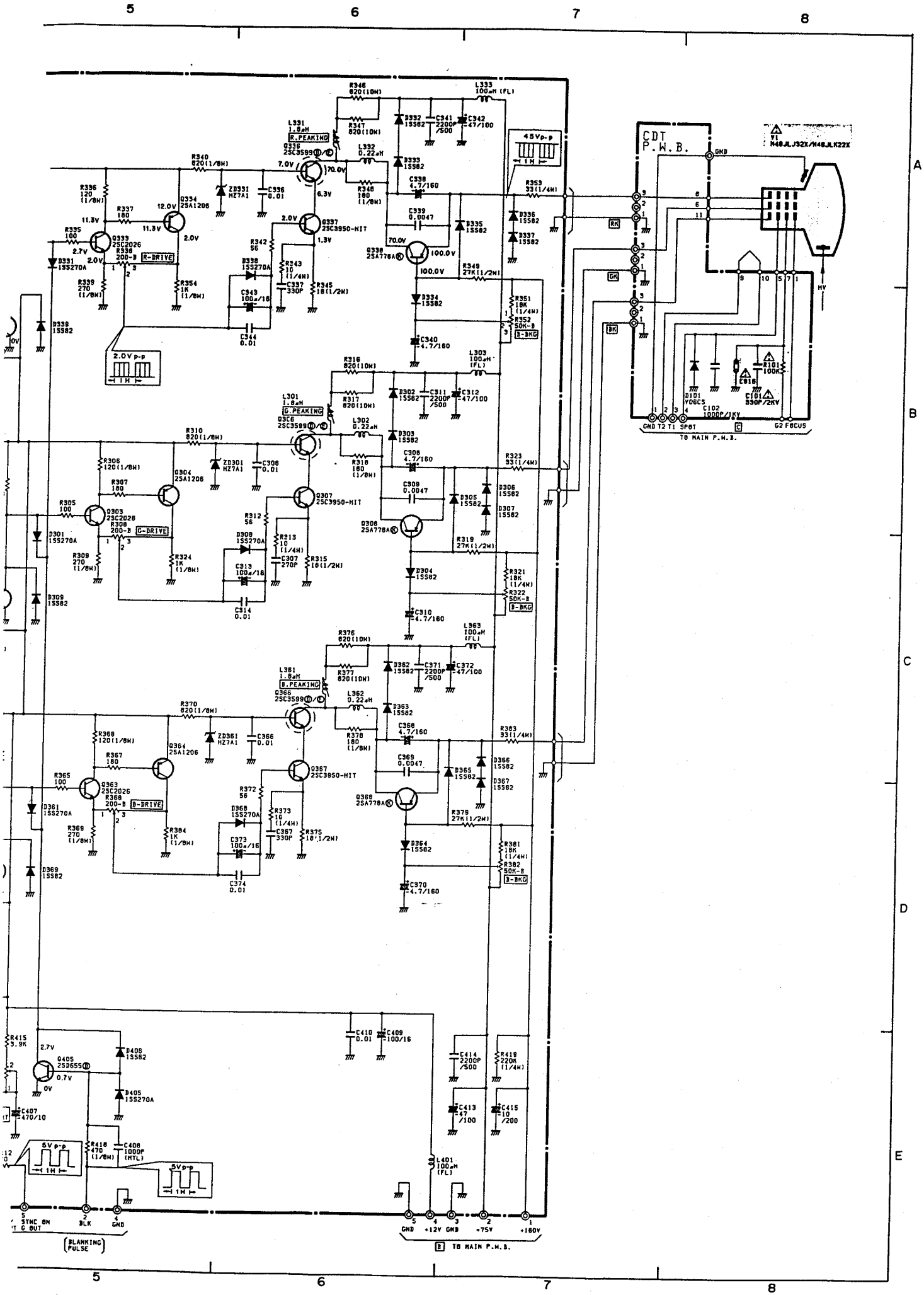
5
6
7
8
A
B
C
D
E
CDT
P.W.B.
GND
RK
GK
BK
HV
GND T2 T1 SPOT
G2 FOCUS
T6 MAIN P.W.B.
R-DRIVE
G-DRIVE
B-DRIVE
R-PEAKING
G-PEAKING
B-PEAKING
R-BKG
G-BKG
B-BKG
45Vp-p
2.0V p-p
5V p-p
1H
SYNC ON G OUT
BLK
GND
(BLANKING PULSE)
GND +12V GND +75V +160V
T6 MAIN P.W.B.

REPLACEMENT PARTS LIST

PRODUCT SAFETY NOTE: Components marked with a ⚠ have special characteristics important to safety. Before replacing any of these components, read carefully, the PRODUCT SAFETY NOTICE of this Service Manual. Don't degrade the safety of the receiver through improper servicing.

ABBREVIATIONS: Capacitors . . . . . CD: Ceramic disk, PF: Polyester film, EL: Electrolytic, PP: Polypropylene, PR: Paper, TA: Tantalum
Resistors . . . . . CF: Carbon film, CC: Carbon composition, OMF: Metal oxide film, VR: Variable resistor, WW: Wire wound, FR: Fuse resistor, MG: Metal glase

SYMBOL NO.	PARTS NO.	DESCRIPTION
		CAPACITORS:
C0201	2337011	61 MC67417
C0231	2337011	61 MC67417
C0261	2337011	61 MC67417
⚠C1101	0244206	CD 330PF +-10% 2KV
C1102	0244436	CD 1000PF +-20% 1KV
C201	0244171	CD 0.01MF +80-20% 50V
C202	0252398	EL 47MF 16V
C203	0244171	CD 0.01MF +80-20% 50V
C204	0252945	EL 47MF 16V
C205	0244171	CD 0.01MF +80-20% 50V
C206	0252928	CHEM CON 100MF 10V
C207	0252928	CHEM CON 100MF 10V
C208	0244171	CD 0.01MF +80-20% 50V
C209	0252944	EL 33MF 16V
C209	0252944	EL 33MF 16V
C210	0252942	EL 10MF 16V
C211	0274667	PF 0.022MF +-5% 50V
C212	0252944	EL 33MF 16V
C213	0244171	CD 0.01MF +80-20% 50V
C214	0252947	EL 220MF 16V
C231	0244171	CD 0.01MF +80-20% 50V
C232	0252398	EL 47MF 16V
C233	0244171	CD 0.01MF +80-20% 50V
C234	0252945	EL 47MF 16V
C235	0244171	CD 0.01MF +80-20% 50V
C236	0252928	CHEM CON 100MF 10V
C237	0252928	CHEM CON 100MF 10V
C238	0244171	CD 0.01MF +80-20% 50V
C239	0252944	EL 33MF 16V
C240	0252942	EL 10MF 16V
C241	0276233	PF 0.022MF +-5% 50V
C242	0252944	EL 33MF 16V
C243	0244171	CD 0.01MF +80-20% 50V
C244	0252947	EL 220MF 16V
C261	0244171	CD 0.01MF +80-20% 50V
C262	0252398	EL 47MF 16V
C263	0244171	CD 0.01MF +80-20% 50V
C264	0252945	EL 47MF 16V
C265	0244171	CD 0.01MF +80-20% 50V
C266	0252928	CHEM CON 100MF 10V
C267	0252928	CHEM CON 100MF 10V
C268	0244171	CD 0.01MF +80-20% 50V
C269	0252944	EL 33MF 16V
C270	0252942	EL 10MF 16V
C271	0274667	PF 0.022MF +-5% 50V
C272	0252944	EL 33MF 16V
C273	0244171	CD 0.01MF +80-20% 50V
C274	0252947	EL 220MF 16V
C301	0244171	CD 0.01MF +80-20% 50V
C302	0252945	EL 47MF 16V
C303	0252420	EL 4.7MF 50V
C304	0244171	CD 0.01MF +80-20% 50V
C305	0276823	PF 0.01MF +-5% 50V
C306	0244171	CD 0.01MF +80-20% 50V
C307	0248694	CD 270PF +-5% 50V
C308	0255505	EL 4.7MF 160V
C309	0244509	CD 4700PF +-10% 500V
C310	0255505	EL 4.7MF 160V
C311	0244505	CD 2200PF +-10% 50V
C312	0258127	EL 47MF +-20% 100V
C313	0256505	EL 100MF 16V
C314	0244171	CD 0.01MF +80-20% 50V
C331	0244171	CD 0.01MF +80-20% 50V
C332	0252945	EL 47MF 16V
C333	0252420	EL 4.7MF 50V
C334	0244171	CD 0.01MF +80-20% 50V
C335	0276823	PF 0.01MF +-5% 50V
C336	0244171	CD 0.01MF +80-20% 50V
C337	0248696	CD 330PF +-5% 50V
C338	0255505	EL 4.7MF 160V
C339	0244509	CD 4700PF +-10% 500V
C340	0255505	EL 4.7MF 160V
C341	0244505	CD 2200PF +-10% 50V
C342	0258127	EL 47MF +-20% 100V
C343	0254505	EL 100MF 16V
C344	0244171	CD 0.01MF +80-20% 50V
C361	0244171	CD 0.01MF +80-20% 50V
C362	0252945	EL 47MF 16V
C363	0252420	EL 4.7MF 50V
C364	0244171	CD 0.01MF +80-20% 50V
C365	0276823	PF 0.01MF +-5% 50V
C366	0244171	CD 0.01MF +80-20% 50V
C367	0248696	CD 330PF +-5% 50V
C368	0255505	EL 4.7MF 160V
C369	0244509	CD 4700PF +-10% 500V
C370	0255505	EL 4.7MF 160V
C371	0244505	CD 2200PF +-10% 50V
C372	0258127	EL 47MF +-20% 100V
C373	0256505	EL 100MF 16V
C374	0244171	CD 0.01MF +80-20% 50V
C401	0252975	EL 2.2MF 50V
C402	0248684	CD 100PF +-5% 50V
C403	0274667	PF 0.022MF +-5% 50V
C404	0274667	PF 0.022MF +-5% 50V
C406	0252945	EL 47MF 16V
C407	0252931	EL 470MF 10V
C408	0274651	PF 1000PF +-5% 50V
C409	0254505	EL 100MF 16V
C410	0244171	CD 0.01MF +80-20% 50V
C413	0258127	EL 47MF +-20% 100V
C414	0244505	CD 2200PF +-10% 50V
C415	0255028	EL 10MF 200V
C602	0292716	TA 1.0MF +-20% 20V
C603	0276821	PF 6800PF +-5% 50V
C604	0252986	EL 1000MF 50V
C605	0252984	EL 330MF 50V
C606	0274667	PF 0.022MF +-5% 50V
C607	0248696	CD 330PF +-5% 50V
⚠C608	0275821	PF 0.047MF +-10% 100V
C609	0252960	EL 1MF 25V
C610	0252986	EL 1000MF 50V
C611	0248696	CD 330PF +-5% 50V
C612	0258105	EL 2.2MF 50V
C613	0274665	PF 0.015MF 50V
C614	0252396	EL 10MF 16V
C701	0252913	EL 470MF 6.3V
C702	0274654	PF 1800PF +-5% 50V (A1EX, A1UX ONLY)
C702	0274651	PF 1000PF +-5% 50V (A3EX, A3UX ONLY)
C703	0276823	PF 0.01MF +-5% 50V
C704	0274653	PF 1500PF +-5% 50V
C705	0244115	CD 560PF +-10% 50V
C706	0258104	EL 1MF 50V
C707	0276829	PF 0.033MF +-5% 50V
C708	0248682	CD 82PF +-5% 50V
C709	0244139	CD 1000PF +-10% 50V
C710	0252973	EL 0.47MF 50V
⚠C711	0299013	PP 3300PF 100V
⚠C712	0252942	EL 10MF 16V
C714	0252910	EL 100MF 6.3V
C751	0299911	CQ 932ED
C753	0243503	CD 150PF +-10% 500V
⚠C754	0243837	CD 330PF +-10% 2.5KV (A1EX, A1UX ONLY)
⚠C754	0243839	CD 180PF +-10% 2.5KV (A3EX, A3UX ONLY)
⚠C755	0299984	PP 0.022MF +-5% 630V (A1EX, A1UX ONLY)
⚠C755	0299983	PP 0.018MF +-5% 630V (A3EX, A3UX ONLY)
⚠C756	0299984	PP 0.022MF +-5% 630V (A1EX, A1UX ONLY)
⚠C756	0299983	PP 0.018MF +-5% 630V (A3EX, A3UX ONLY)
⚠C757	0299985	PP 0.027MF +-5% 630V (A1EX, A1UX ONLY)
⚠C757	0299984	PP 0.022MF +-5% 630V (A3EX, A3UX ONLY)
⚠C758	0299979	PP 4700PF +-5% 630V (A1EX, A1UX ONLY)
⚠C758	0299969	PP 1000PF +-5% 630V (A3EX, A3UX ONLY)
⚠C759	0299934	PP 0.47MF +-10% 200V (A1EX, A1UX ONLY)
⚠C759	0299932	PP 0.33MF +-10% 200V (A3EX, A3UX ONLY)
⚠C760	0299934	PP 0.47MF +-10% 200V (A1EX, A1UX ONLY)
⚠C760	0299933	PP 0.39MF +-10% 200V (A3EX, A3UX ONLY)
C761	0276829	PF 0.033MF +-5% 50V
C762	0275813	PF 2200PF +-10% 100V
C764	0274651	PF 1000PF +-5% 50V
C765	0248724	CD 100PF +-10% 50V
C767	0299989	PF 0.056MF +-5% 630WV
C768	0255524	EL 4.7MF +-20% 250V
C769	0255027	EL 4.7MF +-20% 200V
C770	0274775	PF 0.1MF +-10% 50V
C771	0258104	EL 1MF 50V
C772	0274653	PF 1500PF +-5% 50V
C773	0255510	EL 100MF +-20% 160V
⚠C774	0299934	PP 0.47MF +-10% 200V (A1EX, A1UX ONLY)
⚠C774	0299933	PP 0.39MF +-10% 200V (A3EX, A3UX ONLY)
C776	0252719	EL 470MF 16V
C777	0253917	EL 22MF +-20% 100V
C778	0274667	PF 0.022MF +-5% 50V
C779	0299009	PP 2200PF +-5% 100V
C780	0254515	EL 10MF +-20% 25V
C781	0258104	EL 1MF 50V
C782	0258104	EL 1MF 50V
⚠C783	0243837	CD 330PF +-10% 2.5KV
C784	0244501	CD 1000PF +-10% 500V
C785	0276811	PF 1000PF +-5% 50V
C801	0252913	EL 470MF 6.3V
C803	0276823	PF 0.01MF +-5% 50V
C804	0252974	EL 1MF 50V
C805	0274651	PF 1000PF +-5% 50V
C806	0248692	CD 220PF +-5% 50V
C808	0244230	CD 220PF+-10% 50V
⚠C901	0279698	MPF 0.22MF 250V (A1EX, A3EX ONLY)
⚠C904	0279698	PLASTIC CAPACITOR
⚠C906	0249395	CD 4700PF +100 -0%
⚠C907	0249395	CD 4700PF +100 -0%
⚠C908	0249395	CD 4700PF +100 -0%
⚠C909	0249395	CD 4700PF +100 -0%
⚠C910	0258642	EL 680MF +-20% 25V
⚠C911	0258643	EL 680MF 200V
C912	0258106	EL 3.3MF 50V

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SYMBOL NO.	PARTS NO.	DESCRIPTION
C913	0244215	CD 2200PF +-10% 2KV
C914	0258128	EL 100MF +-20% 100V
C915	0258108	EL 10MF 50V
C916	0299001	PP 0.001MF +-2% 100V
C917	0274657	PF 0.0033UF +-5% DC 50WV
C918	0258107	EL 4.7MF +-20% 50V
C920	0248698	CD 560PF +-5% 50V
C921	0258108	EL 10MF 50V
C922	0274667	PF 0.022MF +-5% 50V
C923	0275816	PF 6800PF +-10% 100V
C925	0247858	CD 150PF +-5% 500V
C926	0258108	EL 10MF 50V
C927	0274651	PF 1000PF +-5% 50V
C930	0243839	CD 180PF +-10% 2.5KV
C931	0243839	CD 180PF +-10% 2.5KV
C932	0243839	CD 180PF +-10% 2.5KV
C933	0244505	CD 2200PF +-10% 50V
C934	0255511	EL 220MF 16UV
C935	0258129	EL 220MF +-20% 100V
C936	0255010	EL 1000MF +-20% 31.5V
C937	0254523	EL 1000MF 25V
C938	0258112	EL 100MF 50V
C939	0254519	EL 100MF +-20% 25V
C940	0254508	CE 470MF +-20% 16V
C941	0255509	EL 47MF 160V
⚠ C950	0249392	CD 2200PF +-10% AC400V
⚠ C991	0249391	CD 1000PF 400V
⚠ C992	0249391	CD 1000PF 400V
		RESISTORS;
⚠ R101	0179549	MG 100K OHM +-5% 1/8W
R201	0114062	CF 75 OHM +-5% 1/4W
R202	0150136	VR 5K OHM-B
R203	0187099	CF 27K OHM +-5% 1/16W
R204	0187093	CF 15K OHM +-5% 1/16W
R205	0100045	CF 150 OHM +-5% 1/8W
R206	0187041	CF 100 OHM +-5% 1/16W
R207	0100048	CF 200 OHM +-5% 1/8W
R208	0100053	CF 330 OHM +-5% 1/8W
R209	0187047	CF 180 OHM +-5% 1/16W
R210	0187072	CF 2K OHM +-5% 1/16W
R211	0187065	CF 1K OHM +-5% 1/16W
R212	0187041	CF 100 OHM +-5% 1/16W
R213	0100055	CF 390 OHM +-5% 1/8W
R214	0114059	CF 56 OHM +-5% 1/4W
R215	0100055	CF 390 OHM +-5% 1/8W
R216	0150136	VR 5K OHM-B
R217	0187041	CF 100 OHM +-5% 1/16W
R218	0187101	CF 33K OHM +-5% 1/16W
R219	0187041	CF 100 OHM +-5% 1/16W
R220	0187101	CF 33K OHM +-5% 1/16W
R221	0100051	CF 270 OHM +-5% 1/8W
R222	0187047	CF 180 OHM +-5% 1/16W
R223	0187067	CF 1.2K OHM +-5% 1/16W
R224	0187047	CF 180 OHM +-5% 1/16W
R225	0187065	CF 1K OHM +-5% 1/16W
R226	0187021	CF 15 OHM +-5% 1/16W
R227	0187089	CF 10K OHM +-5% 1/16W
R228	0187063	CF 820 OHM +-5% 1/16W
R229	0187033	CF 470OHM +-5% 1/16W
R231	0114062	CF 75 OHM +-5% 1/4W
R232	0150136	VR 5K OHM-B
R233	0187099	CF 27K OHM +-5% 1/16W
R234	0187093	CF 15K OHM +-5% 1/16W
R235	0100065	CF 150 OHM +-5% 1/8W
R236	0187041	CF 100 OHM +-5% 1/16W
R237	0100048	CF 200 OHM +-5% 1/8W
R238	0100053	CF 330 OHM +-5% 1/8W
R239	0187047	CF 180 OHM +-5% 1/16W
R240	0187072	CF 2K OHM +-5% 1/16W
R241	0187065	CF 1K OHM +-5% 1/16W
R242	0187041	CF 100 OHM +-5% 1/16W
R243	0100055	CF 390 OHM +-5% 1/8W
R244	0114059	CF 56 OHM +-5% 1/4W
R245	0100055	CF 390 OHM +-5% 1/8W
R246	0150136	VR 5K OHM-B
R247	0187041	CF 100 OHM +-5% 1/16W
R248	0187101	CF 33K OHM +-5% 1/16W
R249	0187041	CF 100 OHM +-5% 1/16W
R250	0187101	CF 33K OHM +-5% 1/16W
R251	0100051	CF 270 OHM +-5% 1/8W
R252	0187047	CF 180 OHM +-5% 1/16W
R253	0187067	CF 1.2K OHM +-5% 1/16W
R254	0187047	CF 180 OHM +-5% 1/16W
R255	0187065	CF 1K OHM +-5% 1/16W
R256	0187021	CF 15 OHM +-5% 1/16W
R257	0187089	CF 10K OHM +-5% 1/16W
R258	0187063	CF 820 OHM +-5% 1/16W
R259	0187033	CF 470OHM +-5% 1/16W
R261	0114062	CF 75 OHM +-5% 1/4W
R262	0150136	VR 5K OHM-B
R263	0187099	CF 27K OHM +-5% 1/16W
R264	0187093	CF 15K OHM +-5% 1/16W
R265	0100045	CF 150 OHM +-5% 1/8W
R266	0187041	CF 100 OHM +-5% 1/16W
R267	0100048	CF 200 OHM +-5% 1/8W
R268	0100053	CF 330 OHM +-5% 1/8W
R269	0187047	CF 180 OHM +-5% 1/16W
R270	0187072	CF 2K OHM +-5% 1/16W
R271	0187065	CF 1K OHM +-5% 1/16W
R272	0187041	CF 100 OHM +-5% 1/16W
R273	0100055	CF 390 OHM +-5% 1/8W
R274	0114059	CF 56 OHM +-5% 1/4W
R275	0100055	CF 390 OHM +-5% 1/8W
R276	0150136	VR 5K OHM-B
R277	0187041	CF 100 OHM +-5% 1/16W
R278	0187101	CF 33K OHM +-5% 1/16W

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SYMBOL NO.	PARTS NO.	DESCRIPTION
R279	0187041	CF 100 OHM +-5% 1/16W
R280	0187101	CF 33K OHM +-5% 1/16W
R281	0100051	CF 270 OHM +-5% 1/8W
R282	0187047	CF 180 OHM +-5% 1/16W
R283	0187067	CF 1.2K OHM +-5% 1/16W
R284	0187047	CF 180 OHM +-5% 1/16W
R285	0187065	CF 1K OHM +-5% 1/16W
R286	0187021	CF 15 OHM +-5% 1/16W
R287	0187089	CF 10K OHM +-5% 1/16W
R288	0187063	CF 820 OHM +-5% 1/16W
R289	0187033	CF 470HM +-5% 1/16W
R301	0113721	CF 68 OHM +-5% 1/2W
R302	0187041	CF 100 OHM +-5% 1/16W
R303	0100125	CF 330K OHM +-5% 1/8W
R304	0114149	CF 560 OHM +-5% 1/4W
R305	0187041	CF 100 OHM +-5% 1/16W
R306	0100043	CF 120 OHM +-5% 1/8W
R307	0187047	CF 180 OHM +-5% 1/16W
R308	0150132	VR 200 OHM-B
R309	0100051	CF 270 OHM +-5% 1/8W
R310	0100063	CF 820 OHM +-5% 1/8W
R312	0187035	CF 56 OHM +-5% 1/16W
R313	0114041	CF 10 OHM +-5% 1/4W
R315	0113707	CF 18 OHM +-5% 1/2W
R316	0144017	MF 8200HM +-5% 10W
R317	0144017	MF 8200HM +-5% 10W
R318	0100047	CF 180 OHM +-5% 1/8W
R319	0113785	CF 27K OHM +-5% 1/2W
R321	0114207	CF 18K OHM +-5% 1/4W
R322	0150116	VR 50K OHM-B
R323	0114053	CF 33 OHM +-5% 1/4W
R324	0100065	CF 1K OHM +-5% 1/8W
R331	0113721	CF 68 OHM +-5% 1/2W
R332	0187041	CF 100 OHM +-5% 1/16W
R333	0100125	CF 330K OHM +-5% 1/8W
R334	0114149	CF 560 OHM +-5% 1/4W
R335	0187041	CF 100 OHM +-5% 1/16W
R336	0100043	CF 120 OHM +-5% 1/8W
R337	0187047	CF 180 OHM +-5% 1/16W
R338	0150132	VR 200 OHM-B
R339	0100051	CF 270 OHM +-5% 1/8W
R340	0100063	CF 820 OHM +-5% 1/8W
R342	0187035	CF 56 OHM +-5% 1/16W
R343	0114041	CF 10 OHM +-5% 1/4W
R345	0113707	CF 18 OHM +-5% 1/2W
R346	0144017	MF 8200HM +-5% 10W
R347	0144017	MF 8200HM +-5% 10W
R348	0100047	CF 180 OHM +-5% 1/8W
R349	0113785	CF 27K OHM +-5% 1/2W
R351	0114207	CF 18K OHM +-5% 1/4W
R352	0150116	VR 50K OHM-B
R353	0114053	CF 33 OHM +-5% 1/4W
R354	0100065	CF 1K OHM +-5% 1/8W
R361	0113721	CF 68 OHM +-5% 1/2W
R362	0187041	CF 100 OHM +-5% 1/16W
R363	0100125	CF 330K OHM +-5% 1/8W
R364	0114149	CF 560 OHM +-5% 1/4W
R365	0187041	CF 100 OHM +-5% 1/16W
R366	0100043	CF 120 OHM +-5% 1/8W
R367	0187047	CF 180 OHM +-5% 1/16W
R368	0150132	VR 200 OHM-B
R369	0100051	CF 270 OHM +-5% 1/8W
R370	0100063	CF 820 OHM +-5% 1/8W
R372	0187035	CF 56 OHM +-5% 1/16W
R373	0114041	CF 10 OHM +-5% 1/4W
R375	0113707	CF 18 OHM +-5% 1/2W
R376	0144017	MF 8200HM +-5% 10W
R377	0144017	MF 8200HM +-5% 10W
R378	0100047	CF 180 OHM +-5% 1/8W
R379	0113785	CF 27K OHM +-5% 1/2W
R381	0114207	CF 18K OHM +-5% 1/4W
R382	0150116	VR 50K OHM-B
R383	0114053	CF 33 OHM +-5% 1/4W
R384	0100065	CF 1K OHM +-5% 1/8W
R401	0187041	CF 100 OHM +-5% 1/16W
R402	0100123	CF 270K OHM +-5% 1/8W
R403	0187077	CF 3.3K OHM +-5% 1/16W
R404	0100067	CF 1.2K OHM +-5% 1/8W
R405	0100071	CF 1.8K OHM +-5% 1/8W
R406	0187041	CF 100 OHM +-5% 1/16W
R407	0100052	CF 300 OHM +-5% 1/8W
R408	0150134	VR 1K OHM-B
R409	0100071	CF 1.8K OHM +-5% 1/8W
R410	0187033	CF 470HM +-5% 1/16W
R411	0114161	CF 1K OHM +-5% 1/4W
R412	0187051	CF 270 OHM +-5% 1/16W
R413	0187065	CF 1K OHM +-5% 1/16W
R414	0100047	CF 180 OHM +-5% 1/8W
R415	0187079	CF 3.9K OHM +-5% 1/16W
R416	0150136	VR 5K OHM-B
R418	0100057	CF 470 OHM +-5% 1/8W
R419	0114289	CF 220K OHM +-5% 1/4W
R420	0187047	CF 180 OHM +-5% 1/16W
R421	0187041	CF 100 OHM +-5% 1/16W
R422	0100049	CF 220 OHM +-5% 1/8W
R423	0187065	CF 1K OHM +-5% 1/16W
R451	0159826	VR 1KOHM-B
R452	0159826	VR 1KOHM-B
R601	0187087	CF 8.2K OHM +-5% 1/16W
R602	0150112	VR 2K OHM-B
R603	0187071	CF 1.8K OHM +-5% 1/16W
R604	0113735	CF 270 OHM +-5% 1/2W
R605	0150112	VR 2K OHM-B
R606	0113731	CF 180 OHM +-5% 1/2W
R607	0187055	CF 390 OHM +-5% 1/16W
R608	0187059	CF 560 OHM +-5% 1/16W
⚠ R609	0113726	RD 1100HM +-5% 1/2W
R610	0187086	CF 7.5K OHM +-5% 1/16W
R611	0187093	CF 15K OHM +-5% 1/16W
R612	0187093	CF 15K OHM +-5% 1/16W

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SYMBOL NO.	PARTS NO.	DESCRIPTION
R613	0187085	CF 6.8K OHM +-5% 1/16W
⚠ R614	0150110	VR 500 OHM-B
⚠ R615	0150110	VR 500 OHM-B
⚠ R616	0187049	CF 220 OHM +-5% 1/16W
⚠ R617	0113692	CF 4.7 OHM +-5% 1/2W
⚠ R618	0113692	CF 4.7 OHM +-5% 1/2W
R619	0187091	CF 12K OHM +-5% 1/16W
R620	0150112	VR 2K OHM-B
R621	0150136	VR 5K OHM-B
R701	0113726	RD 100OHM +-5% 1/2W
R702	0187057	CF 470 OHM +-5% 1/16W
R703	0150112	VR 2K OHM-B
R704	0187057	CF 470 OHM +-5% 1/16W
R705	0187059	CF 560 OHM +-5% 1/16W
R706	0187097	CF 22K OHM +-5% 1/16W
R707	0187090	CF 11K OHM +-5% SRD 1/16W
R708	0187067	CF 1.2K OHM +-5% 1/16W
R709	0187065	CF 1K OHM +-5% 1/16W
R710	0187097	CF 22K OHM +-5% 1/16W
⚠ R711	0187061	CF 680 OHM +-5% 1/16W (A1EX, A1UX ONLY)
⚠ R711	0187065	CF 1K OHM +-5% 1/16W (A3EX, A3UX ONLY)
R712	0187097	CF 22K OHM +-5% 1/16W
R713	0187097	CF 22K OHM +-5% 1/16W
R714	0187081	CF 4.7K OHM +-5% 1/16W
R715	0187059	CF 560 OHM +-5% 1/16W
R716	0187059	CF 560 OHM +-5% 1/16W
R717	0187095	CF 18K OHM +-5% 1/16W
R718	0187087	CF 8.2K OHM +-5% 1/16W
R719	0187065	CF 1K OHM +-5% 1/16W
⚠ R720	0187107	CF 56K OHM +-5% 1/16W (A1EX, A1UX ONLY)
⚠ R720	0187105	CF 47K OHM +-5% 1/16W (A3EX, A3UX ONLY)
⚠ R721	0110162	CF 5.1K OHM +-5% 1W (A1EX, A1UX ONLY)
⚠ R721	0110159	CF 3.9K OHM +-5% 1W (A3EX, A3UX ONLY)
⚠ R722	0150136	VR 1K OHM-B
R723	0187071	CF 1.8K OHM +-5% 1/16W
R724	0187076	CF 3K OHM +-5% 1/16W
R725	0187051	CF 270 OHM +-5% 1/16W
R727	0100129	CF 470K OHM +-5% 1/8W
R741	0100085	CF 6.8K OHM +-5% 1/8W
⚠ R742	0110211	MF 39 OHM +-5% 2W
⚠ R743	0110211	MF 39 OHM +-5% 2W
R751	0100067	CF 1.2K OHM +-5% 1/8W
R752	0110367	MF 1.2K OHM +-5% 3W
R754	0113685	CF 2.4 OHM +-5% 1/2W
R755	0100065	CF 1K OHM +-5% 1/8W
R756	0187065	CF 1K OHM +-5% 1/16W
⚠ R757	0187091	CF 12K OHM +-5% 1/16W
⚠ R758	0100043	CF 120 OHM +-5% 1/8W
R759	0100043	CF 120 OHM +-5% 1/8W
R760	0100079	CF 3.9K OHM +-5% 1/8W
R761	0114207	CF 18K OHM +-5% 1/4W
R762	0187065	CF 1K OHM +-5% 1/16W
R763	0150134	VR 1K OHM-B
R764	0187091	CF 12K OHM +-5% 1/16W
R765	0100105	CF 47K OHM +-5% 1/8W
R766	0100075	CF 2.7K OHM +-5% 1/8W
R767	0114205	CF 15K OHM +-5% 1/4W
⚠ R768	0110329	MF 220 OHM +-5% 3W
R769	0100075	CF 2.7K OHM +-5% 1/8W
R770	0119838	FR 0.5 OHM +-5% 1/4W
R771	0187088	CF 9.1K OHM +-5% 1/4W
R772	0150116	RV 10K OHM-B
R773	0187065	CF 1K OHM +-5% 1/16W
R774	0187069	CF 1.5K OHM +-5% 1/16W
R775	0114211	CF 27K OHM +-5% 1/4W
R776	0114211	CF 27K OHM +-5% 1/4W
R777	0187065	CF 1K OHM +-5% 1/16W
R778	0187089	CF 10K OHM +-5% 1/16W
R779	0187065	CF 1K OHM +-5% 1/16W
R780	0100087	CF 8.2K OHM +-5% 1/8W
R781	0100081	CF 4.7K OHM +-5% 1/8W
R782	0187067	CF 1.2K OHM +-5% 1/16W
R783	0187065	CF 1K OHM +-5% 1/16W
R784	0100049	CF 220 OHM +-5% 1/8W
R785	0187089	CF 10K OHM +-5% 1/16W
R786	0100089	CF 10K OHM +-5% 1/8W
R787	0100081	CF 4.7K OHM +-5% 1/8W
R788	0100073	CF 2.2K OHM +-5% 1/8W
R789	0162626	VR 500 OHM-B RA-20
⚠ R790	0119505	FR 2.2 OHM +-5% 1/4W
R791	0114297	CF 470K OHM +-5% 1/4W
R792	0100096	CF 20K OHM +-5% 1/8W
⚠ R793	0114287	CF 180K OHM +-5% 1/4W
⚠ R794	0114203	CF 12K OHM +-5% 1/4W
R795	0113729	CF 150 OHM +-5% 1/2W
R796	0137527	CF 27 OHM +-5% 1/4W
R797	0100073	CF 2.2K OHM +-5% 1/8W
R799	0114205	CF 15K OHM +-5% 1/4W
R801	0187105	CF 47K OHM +-5% 1/16W
R802	0114223	CF 82K OHM +-5% 1/4W
R805	0187095	CF 18K OHM +-5% 1/16W
R804	0187089	CF 10K OHM +-5% 1/16W
R805	0187065	CF 1K OHM +-5% 1/16W
R806	0150112	VR 2K OHM-B
R807	0187041	CF 100 OHM +-5% 1/16W
R808	0187051	CF 270 OHM +-5% 1/16W
R810	0187051	CF 270 OHM +-5% 1/16W
R811	0187089	CF 10K OHM +-5% 1/16W
R812	0113734	CF 240 OHM +-5% 1/2W
R813	0187081	CF 4.7K OHM +-5% 1/16W (A1EX, A1UX ONLY)
R813	0187077	CF 3.3K OHM +-5% 1/16W (A3EX, A3UX ONLY)
⚠ R901	0179639	MG 1M OHM +-5% 1W

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SYMBOL NO.	PARTS NO.	DESCRIPTION
⚠ R902	0141082	MW 6 OHM +-5% 8W
⚠ R903	0141111	CEMENT 2.4 OHM 7W
R904	0110269	MF 10K OHM +-5% 2W
R905	0110269	MF 10K OHM +-5% 2W
R906	0187093	CF 15K OHM +-5% 1/16W
R907	0113791	CF 47K OHM +-5% 1/2W
⚠ R908	0119641	
⚠ R909	0150132	VR 200 OHM-B
⚠ R910	0119609	RN 1.2KOHM +-1% 1/8W
R911	0113754	CF 1.5K OHM +-5% 1/2W
R912	0113754	CF 1.5K OHM +-5% 1/2W
R913	0119641	
R914	0187113	CF 100K OHM +-5% 1/16W
R915	0100129	CF 470K OHM +-5% 1/8W
R916	0187077	CF 3.3K OHM +-5% 1/16W
⚠ R917	0119647	FR 47K OHM +-1% 1/8W
R918	0187053	CF 330 OHM +-5% 1/16W
R919	0187082	CF 5.1K OHM +-5% 1/16W
⚠ R920	0187089	CF 10K OHM +-5% 1/16W
R921	0100119	CF 180K OHM +-5% 1/8W
R922	0100069	CF 1.5K OHM +-5% 1/8W
⚠ R923	0179543	RK 1.2MOHM +-5% 1/2W
R925	0110269	MF 10K OHM +-5% 2W
R926	0113776	CF 12K OHM +-5% 1/2W
R927	0110269	MF 10K OHM +-5% 2W
R928	0143067	RS 820 OHM +-5%
R929	0113791	CF 47K OHM +-5% 1/2W
R930	0187077	CF 3.3K OHM +-5% 1/16W
R931	0187025	CF 22 OHM +-5% 1/16W
⚠ R932	0187057	CF 470 OHM +-5% 1/16W
R933	0187084	CF 6.2K OHM +-5% 1/16W
⚠ R934	0119647	FR 47K OHM +-1% 1/8W
⚠ R935	0101413	METAL COMPOSITION RESISTOR 0.33 OHM +-5% 2W
R936	0113694	CF 5.6 OHM +-5% 1/2W
⚠ R937	0119838	FR 0.5 OHM +-5% 1/4W
⚠ R938	0119838	FR 0.5 OHM +-5% 1/4W
R939	0100069	CF 220 OHM +-5% 1/8W
R940	0187109	CF 68K OHM +-5% 1/16W
R941	0100035	CF 56 OHM +-5% 1/8W
R942	0187086	CF 7.5K OHM +-5% 1/16W
R945	0114151	CF 680 OHM +-5% 1/4W

IC:

IC401	2914391	IC L78N06
⚠ IC601	2912361	IC UPC1498H
⚠ IC701	2917281	IC MA1517NT
IC751	2917641	IC BA1035R
IC752	2917271	IC TDA4950
IC801	2360931	IC M074LS00P
IC802	2362352	IC M074LS123P
⚠ IC901	2366721	IC UPC1394C
IC902	2917701	IC MPC78241
IC903	2369672	IC S1-3122V

TRANSISTORS:

Q201	2321631	TR 2SC2026
Q202	2325541	TR 2SA1206
Q203	2325541	TR 2SA1206
Q204	2320637	TR 2SA673C/D
Q205	2324841	TR 2SC3064
Q206	2321631	TR 2SC2026
Q231	2321631	TR 2SC2026
Q232	2325541	TR 2SA1206
Q233	2325541	TR 2SA1206
Q234	2320637	TR 2SA673C/D
Q235	2324841	TR 2SC3064
Q236	2321631	TR 2SC2026
Q261	2321631	TR 2SC2026
Q262	2325541	TR 2SA1206
Q263	2325541	TR 2SA1206
Q264	2320637	TR 2SA673C/D
Q265	2324841	TR 2SC3064
Q266	2321631	TR 2SC2026
Q301	2320595	TR 2SC458D
Q302	2325541	TR 2SA1206
Q303	2321631	TR 2SC2026
Q304	2325541	TR 2SA1206
Q306	2326422	TR 2SC3599 D/E
Q307	2327471	TR 2SC3950 D/E
Q308	2321111	TR 2SA778A K
Q331	2320595	TR 2SC458D
Q332	2325541	TR 2SA1206
Q333	2321631	TR 2SC2026
Q334	2325541	TR 2SA1206
Q336	2326422	TR 2SC3599 D/E
Q337	2327471	TR 2SC3950 D/E
Q338	2321111	TR 2SA778A K
Q361	2320595	TR 2SC458D
Q362	2325541	TR 2SA1206
Q363	2321631	TR 2SC2026
Q364	2325541	TR 2SA1206
Q366	2326422	TR 2SC3599 D/E
Q367	2327471	TR 2SC3950 D/E
Q368	2321111	TR 2SA778A K
Q401	2325541	TR 2SA1206
Q402	2320595	TR 2SC458D
Q403	2321321	TR 2SA844D/E
Q404	2320595	TR 2SC458D
Q405	2321871	TR 2SD655D
Q406	2321631	TR 2SC2026
Q701	2321321	TR 2SA844D/E
Q702	2325221	TR 2SC1740S
⚠ Q751	2328081	TR 2SC2885K
⚠ Q752	2325821	TR 2SC3412

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SYMBOL NO.	PARTS NO.	DESCRIPTION
Q753	2321993	TR 2SC2271 (E)
Q754	2321993	TR 2SC2271 (E)
Q755	2321993	TR 2SC2271 (E)
Q756	2321993	TR 2SC2271 (E)
Q757	2321993	TR 2SC2271 (E)
Q758	2326795	MMS20
Q759	2325721	TR 2SC1740S
Q760	2321993	TR 2SC2271 (E)
Q761	2321993	TR 2SC2271 (E)
Q762	2321993	TR 2SC2271 (E)
Q763	2320637	TR 2SA673C/D
⚠ Q764	2328021	TR 2SK552
⚠ Q901	2343281	TR 2SC1755D/E
⚠ Q902	2326981	TR 2SC3909
Q903	2320637	TR 2SA673C/D
⚠ Q904	2328231	TF641M(THERMISTOR)
		DIODES;
D101	2330256	DI V06CS
D201	2331912	DI 1SS82
D202	2331912	DI 1SS82
D204	2337341	DI 1SS270A
D231	2331912	DI 1SS82
D232	2331912	DI 1SS82
D234	2337341	DI 1SS270A
D261	2331912	DI 1SS82
D262	2331912	DI 1SS82
D264	2337341	DI 1SS270A
D301	2337341	DI 1SS270A
D302	2331912	DI 1SS82
D303	2331912	DI 1SS82
D304	2331912	DI 1SS82
D305	2331912	DI 1SS82
D306	2331912	DI 1SS82
D307	2331912	DI 1SS82
D308	2337341	DI 1SS270A
D309	2331912	DI 1SS82
D331	2337341	DI 1SS270A
D332	2331912	DI 1SS82
D333	2331912	DI 1SS82
D334	2331912	DI 1SS82
D335	2331912	DI 1SS82
D336	2331912	DI 1SS82
D337	2331912	DI 1SS82
D338	2337341	DI 1SS270A
D339	2331912	DI 1SS82
D361	2337341	DI 1SS270A
D362	2331912	DI 1SS82
D363	2331912	DI 1SS82
D364	2331912	DI 1SS82
D365	2331912	DI 1SS82
D366	2331912	DI 1SS82
D367	2331912	DI 1SS82
D368	2337341	DI 1SS270A
D369	2331912	DI 1SS82
D401	2331912	DI 1SS82
D403	2337341	DI 1SS270A
D404	2337341	DI 1SS270A
D405	2337341	DI 1SS270A
D406	2331912	DI 1SS82
D407	2330352	DI 1S2076A
D408	2331912	DI 1SS82
D409	2331912	DI 1SS82
D410	2331912	DI 1SS82
D411	2331912	DI 1SS82
D412	2337341	DI 1SS270A
D601	2330256	DI V06CS
D701	2337341	DI 1SS270A
D703	2331912	DI 1SS82
D704	2331912	DI 1SS82
D705	2331912	DI 1SS82
D751	2337571	DI HRP22
⚠ D752	2346401	DI CTU-G5DR
D753	2338871	DI RU4M
D754	2337341	DI 1SS270A
D755	2337341	DI 1SS270A
D756	2337341	DI 1SS270A
D757	2337571	DI HRP22
⚠ D758	2337091	DI RG2A
D759	2330551	DI V09C
D760	2330551	DI V09C
D761	2337091	DI RG2A
D762	2330551	DI V09C
D763	2337341	DI 1SS270A
D801	2337341	DI 1SS270A
D802	2337341	DI 1SS270A
D803	2331912	DI 1SS82
D804	2331912	DI 1SS82
⚠ D901	2339711	DI RAV40G
D902	2331472	DI V-17CS
D903	2338531	DI EG01C
D904	2335261	DI EU-2
⚠ D905	2339491	DI AM01Z
D906	2339491	DI AM01Z
⚠ D907	2337341	DI 1SS270A
D908	2331991	DI RD2A
D909	2338561	DI ERA32-02
⚠ D920	2337991	DI RG4C
⚠ D921	2337091	DI RG2A
D922	2338561	DI ERA32-02
D923	2338561	DI ERA32-02
D924	2337341	DI 1SS270A
D925	2337341	DI 1SS270A
D927	2332912	LED SLR55MC
ZD301	2331811	ZD HZ7(A)1
ZD331	2331811	ZD HZ7(A)1
ZD361	2331811	ZD HZ7(A)1
ZD701	2331802	ZD HZ-6A2

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SYMBOL NO.	PARTS NO.	DESCRIPTION
ZD801	2331797	ZD 5C(C)1
ZD802	2331797	ZD 5C(C)1
ZD901	2334322	ZD RD36EB1
ZD902	2334122	ZD RD5.1EB1
ZD903	2332221	ZD HZ6L-B2
		THERMISTORS;
⚠ TH901	2340521	PTC THERMISTOR
⚠ TH902	2340821	THERMISTOR
⚠ TH903	2340361	112103-3
		COILS;
L301	2142774	IFC COIL
L302	2122291	LA AXIAL COIL 0.22 MICROH
L303	2123958	FILTER COIL
L331	2142774	IFC COIL
L332	2122291	LA AXIAL COIL 0.22 MICROH
L333	2123958	FILTER COIL
L361	2142774	IFC COIL
L362	2122291	LA AXIAL COIL 0.22 MICROH
L363	2123958	FILTER COIL
L401	2123958	FILTER COIL
⚠ L752	2220471	DUMMY COIL
⚠ L753	2272601	FILTER COIL
L754	2120484	FILTER COIL 3.3MH
L755	2123584	FL-9Z 18MHz
L757	2272591	H.LINEARITY COIL (A1EX, A1UX ONLY)
L757	2272592	H.LINEARITY COIL (A3EX, A3UX ONLY)
L758	2121211	FILTER COIL
⚠ L901	2122111	LINE FILTER COIL (A1EX, A3EX ONLY)
⚠ L901	2122112	LINE FILTER COIL (A1UX, A3UX ONLY)
⚠ L902	2122111	LINE FILTER COIL (A1EX, A3EX ONLY)
⚠ L903	2122693	LINE FILTER
L904	2122125	FIXED COIL
⚠ L905	2164082	DEGAUSSING COIL
L906	2120333	FILTER COIL
L907	2122093	FILTER COIL
		TRANSFORMERS;
⚠ T751	2260261	DRIVE TRANSFORMER
⚠ T752	2435041	FBT
⚠ T901	2272452	SWITCHING TRANSFORMER
⚠ T902	2260071	TRANSFORMER

SYMBOL NO.	PARTS NO.	DESCRIPTION
		COMPOUND COMPONENTS;
⚠ CP751	2370152	MODULE MM71U1MD
		FUSES;
⚠ F901	2720404	FUSE 4A (A1EX, A3EX ONLY)
⚠ F901	2720963	FUSE 4A (A1UX, A3UX ONLY)
⚠ TF901	2720821	FUSE 2A
		MISCELLANEOUS;
⚠ RL901	2640336	RELAY
⚠ RL902	2640336	RELAY
1003	3763751	SK BINDER
	3015331	FRAME
	3702351	TILT BASE(UPPER)
	4273852	HEAT SINK
	3704371	LED HOLDER
	2783851	MICA SEAT
	2780261	INSULATING PLATE
	3748741	TRANSISTOR WASHER
	4520883	M3X12 SCREW WITH WASHER
	3763751	SK BINDER
	2771892	FERRITE BEADS CORE 00A
	4520882	M3 SCREW WITH WASHER
	4525701	3X8 E TIGHT SCREW WITH KNURL
	3460941	REAR COVER
	3702361	TILT BASE(LOWER)
	4319361	M4X12 CE KNURL TAPPING SCREW
	4519305	3X16 B TIGHT TAPPING SCREW
	4616823	RUBBER FEET
	3702931	TILT CAP
	3727952	DEGAUSSING COIL HOLDER
	3704351	TILT SUPPORTER
	3704341	TILT SLIDER
	3733241	LEAD CLAMP
	4520782	M5X12 SCREW
	0649092	WASHER
	4522881	3X8 CE KNURL SCREW
	4319361	M4X12 CE KNURL TAPPING SCREW
	3727702	PWB PLASTIC HOLDER
	3727702	PWB PLASTIC HOLDER
	3754391	PWB SPACER 8
	3763751	SK BINDER
	3268081	KNOB (POWER SW)
	3262067	VR KNOB
	4519512	TAPPING SCREW 4X16 MM
	4519512	TAPPING SCREW 4X16 MM
	4319361	M4X12 CE KNURL TAPPING SCREW
	4522881	3X8 CE KNURL SCREW
	4522881	3X8 CE KNURL SCREW
	3717062	CABLE CRIP

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SYMBOL NO.	PARTS NO.	DESCRIPTION
—	4519504	3X8 SELF TAPPING SCREW BLACK
—	3763751	SK BINDER
	3763751	SK BINDER
—	4518382	M4X8 BT SCREW
⚠ A	2357724	CDT (M48JLJ32X)
⚠ A10	2357724	CDT (M48JLJ32X)
E002	2672091	BNC PIN-JACK
E003	2672091	BNC PIN-JACK
E05	2271461	MAGNET
E09	3350941	EARTH SPRING
E701	2786281	MICA SHEET
E702	2786301	TRS SHEET
E703	4520883	M3X12 SCREW WITH WASHER
E704	4520883	M3X12 SCREW WITH WASHER
E70A	4520883	M3X12 SCREW WITH WASHER
E803	2969846	
E804	2663923	CONNECTOR
E811	2953142	CDT SOCKET
E812	2663822	3P PLUG PIN
⚠ E816	2340038	SPARK GAP
E901	2786281	MICA SHEET
E902	2786301	TRS SHEET
E903	2771892	FERRITE BEADS CORE 004
E904	2771894	FERRITE BEADS CORE
E905	4520883	M3X12 SCREW WITH WASHER
⚠ E910	2991551	AC INLET WITH FILTER
E925	4520881	M3X8 SCREW (WITH WASHER)
N001	4298322	HEAT SINK (VIDEO)
S501	2632861	SLIDE SW
S601	2632891	PUSH SW
⚠ S901	2632772	PUSH SW
⚠ S902	2620662	AC SELECTOR SWITCH
S903	2631725	KEY SWITCH
⚠	2953702	FUSE HOLDER
		(A1EX, A3EX ONLY)
⚠	2951011	FUSE HOLDER
		(A1UX, A3UX ONLY)
⚠	2743302	POWER CORD
		(A1EX, A3EX ONLY)
⚠	2967141	POWER CORD
		(A1UX, A3UX ONLY)

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SYMBOL NO.	PARTS NO.	DESCRIPTION